The PROFIT AND LOSS ACCOUNT
OF
MODERN MEDICINE
and Other Papers

McGUIRE

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AND

OTHER PAPERS

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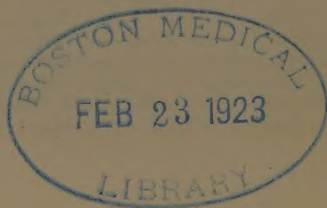
Preface or Apology

Having occasion to refer to a paper I had written several years ago, I was unable to find a reprint of it, or the issue of the journal in which it appeared.

This led to an effort to secure a copy of all the articles I had published and to put the collection in shape for personal reference.

The possession of the material in concrete form suggested the possibility of making it into a book, and this at first rather vague idea finally became a desire so strong that I determined to gratify it. In indulging myself I have tried to show consideration for my prospective reader by not printing all I have written.

The various papers have been arranged with reference to the subjects treated rather than the date at which they appeared.

While I have serious misgivings as to the merit of the volume, I have no doubts as to the extent of its circulation, for it is intended for private distribution and will not be offered for sale.
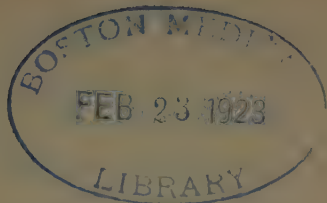
STUART McGUIRE.

Richmond, Va., May, 1915.

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The Profit and Loss Account of Modern Medicine *

Mr. Chairman, Fellows of the Southern Medical Association, Ladies and Gentlemen:

My first duty is to repeat my thanks which I fear were but poorly expressed at the time of my election in Lexington, Kentucky, as President of the Southern Medical Association.

To be chosen to preside over a body of more than three thousand men, representing the best element of the medical profession in the sixteen Southern States, is a trust and honor that causes mingled feelings of humility and pride. No one elected to the position I occupy could believe himself worthy, and no one could fail to be proud of his good fortune.

It is especially pleasing to preside at a session of the Association held in my own city, and to be one of many to bid you welcome to Richmond and to Virginia.

The subject of my address is "The Profit and Loss Account of Modern Medicine." Wonderful progress has been made in medicine during recent years, but the profit has been attended by loss, which must be considered in balancing the account. In taking stock of the gain we will find inspiration for the future; in counting the cost we may guard against the undue sacrifices of the past.

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* Address at the meeting of the Southern Medical Association, Richmond, Va., November, 1914.

MODERN MEDICAL EDUCATION.

The most distinct profit and loss in modern medicine have come about through changes in medical education, which have been accomplished largely through the efforts of the American Medical Association, the Association of American Medical Colleges, and the Carnegie Foundation for the Advancement of Teaching.

It was recognized that each year a progressively increasing number of low grade practitioners were being graduated by medical colleges and licensed by State governments. An investigation of the medical schools showed that many of them were poorly equipped, had scant clinical material and lacked sufficient funds to secure the necessary time of efficient teachers.

To remedy this evil a deliberate and systematic movement was inaugurated to lessen the number and improve the quality of the men who are being added to the ranks of the profession. By moral suasion, by State legislation and by the combined efforts of the better schools, the entrance requirements were advanced, the number and length of the teaching sessions were increased, the character and scope of the curricula were improved, and the minimum number and approximate pay of the full time teachers were specified.

The result of this movement has been that in the last ten years the total number of medical schools in the United States has been reduced from 186 to 101 and the total number of medical students from 28,142 to 16,502. In other words, 85 medical schools, weak either educationally or financially, have ceased to teach, and over 10,000 medical students not properly qualified for

the profession have ceased to study. And the end is not yet.

In no section of the country has this campaign been more effective than in our own. The Council of the American Medical Association, in its last report said: "The most serious problems of medical education are no longer to be found in the South, but rather in some of the large cities of the East and North."

The benefit of this movement is already markedly seen in the medical colleges, where the qualifications of the student are found improved and the character of the instruction more satisfactory. A medical student now begins his studies with a knowledge of the elementary sciences. He it taught the fundamental medical facts in laboratory and dissecting hall by trained instructors who give their entire time to the work. When he comes to study disease, it is disease in people, not in books. He is brought to the bedside of the patient and encouraged to observe, to weigh and to decide. The new idea in teaching tends to make of the student an active investigator instead of a passive hearer, and of the teacher a sympathetic guide rather than a verbose expositor.

There has not yet been time for the benefit of the change to be very apparent in actual practice, but the lessened number and improved quality of the graduates turned out each year will unquestionably in the end result in a great improvement in the ethics and efficiency of the profession.

The profit, however, has not been without its loss, and while we congratulate ourselves on what has been gained by this educational movement, it is only just to

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count what it has cost. Many worthy although struggling colleges have been put out of existence and their property practically confiscated, and many earnest and promising young men have been denied an opportunity to study medicine because of some defect in their preliminary high-school or college education. Again the modern medical school is not self-supporting and is a heavy financial tax on public funds or private philanthropy. Expensive laboratories, salaries of full time instructors and the necessary provisions for clinical teaching, impose a cost that can never again be met by tuition fees. Each matriculate is an added burden, and the school of today finds itself in a vicious circle; the better it teaches the more students it gets, the more students it gets the more money it loses. If each student were charged what it actually cost to teach him, none but the rich could afford to study medicine. Doctors are a necessity, not a luxury, and as the rich do not care to become doctors, then the rich in the future will have to be educated to contribute of their wealth to make doctors. Medical education has ceased to be a business and become a philanthropic work which must be supported by State appropriations and individual benefactions.

Finally, the cost of the modern method of teaching is seen in the graduate himself. If he has not paid in money he has been made to pay in time for his education. He has been kept in laboratory, lecture hall and hospital ward, a non-producer, dependent on others for his support, until he reaches an age at which most of his contemporaries are married and settled in life. He is conscious of the sacrifice he has made, and usually over appreciative of the attainments he has acquired.

He desires to be a specialist, and will only do general practice as a means to an end. He is determined to locate in a city and unwilling to settle in the country, preferring to starve himself in the one rather than to starve his ambitions in the other.

This results in an urban congestion and rural depletion of medical men which has reached a point to give serious concern, and for which some remedy must be found. It has been proposed that special medical schools be operated to produce low-grade practitioners for country consumption, but this is impracticable and unthinkable.

The remedy for the evil is to make country practice less arduous and more profitable, and this will come about in time with the evolution of our social, economic and political life. When we compare the conditions that exist in the country today with those which existed even twenty years ago, and recall the changes that have resulted from the good-roads movement, the development of the automobile, the installation of telephones, the introduction of parcel post and rural mail delivery, the improvement of the public school system, the perfection of heating and lighting plants and the invention of labor saving machinery, it is not difficult to believe that in the not far distant future, the increased population due to emigration of health and pleasure seekers from the city, and the increased prosperity due to intensified and scientific farming, will make the life of the country doctor one that will attract and hold the best representatives of the profession.

Having considered the profit and loss account of modern medical education, we now come to what we have

gained and lost in the doctor himself. The physician of the old school was usually a gentleman by birth and breeding. He was given a classical education not because of his future profession, but because it was a privilege accorded his brothers as well as himself, without reference to their future vocations in life. His preparation for practice consisted in reading medicine for a few months in a preceptor's office and then attending lectures for one or two years at a medical college. His very lack of technical training gave him independence and resourcefulness, and with experience he gained an ability to make a diagnosis by intuition and to apply treatment, which, while often empirical was usually effective. He was no specialist, but attended every member of a household, because a family was a unit and his art was catholic. He knew the constitution of his patient because neighbor married neighbor and lived where they were born. He was not only physician but friend, confidant and counsellor as well. In his personal affairs he was unbusiness-like, rarely sending bills and accepting such honoraria as were tendered him in settlement of his accounts. In public affairs he was prominent and his views and opinions had weight in matters of church and State. He had his weaknesses and his faults. Measured by modern standards he was ignorant and sometimes mischievous, but he served well his day and generation and was a most lovable old aristocrat.

The modern medical man begins to be trained for his profession while yet a boy. His preliminary education in high-school and college is scientific rather than classical, and gives him knowledge rather than culture. When he completes his four year's course in a medical college

and one year post-graduate work in a hospital, he represents an investment of time and money covering a period of from fourteen to sixteen years. He is no longer a boy, but an eminently practical man, and he regards his calling as more a business than a profession. He recognizes the fact that he lives in an age of specialization, that no one man can now meet all the professional needs of a patient, and that the day of the domination of the family physician, on the one hand, and the dependence of the family on the other, has passed. He understands that with the freedom now customary of choosing different attendants to treat separate ailments, the factors of social position, family connection, and even personal friendship count for little, but that a doctor is employed because he is believed to be the most efficient man available to relieve the patient or cure the disease. He recognizes the necessity of sobriety, industry, honesty and clean living, but he also knows that the public no longer measures experience by age, virtue by matrimony, or morality by affiliation with the Church, and that the first and last prerequisite for success is professional ability.

Such being the situation with which he has to deal the modern medical man early chooses a special line of work, and devotes every effort and utilizes every opportunity to perfect himself and impress the community with his proficiency. His attitude to the public has changed, and he no longer cloaks his reasons in secrecy or his actions in mystery, but deals frankly with his patients, explains cause and effect, and secures their co-operation in carrying out treatment. The modern doctor has discarded the silk hat and frock coat of his predecessor and put on the sack suit of the business man. In a sense he has

become commercial. His offices are not only provided with instruments of diagnostic precision, but also with modern methods of keeping accounts and collecting fees.

From the foregoing crude pen picture must be inferred what has been the profit and what the loss to the public and to the profession from the modern doctor. We have lost a character dear to literature, and gained a type, perhaps less ethical and more mercenary, but which is certainly a scientific instrument of greater professional efficiency.

THE MODERN SPECIALIST.

The development of the modern specialist is a source of both profit and loss to medicine. The profit is too apparent to need emphasis. The specialist, by concentration of study and limitation of practice to certain definite organs or diseases, is able in a few years to acquire greater diagnostic skill and more successful methods of treatment in his special line of work than another man of equal ability would obtain in a lifetime of general practice.

The presence of a specialist in a community not only gives to patients suffering with certain diseases opportunities for efficient treatment, but also offers to the surgeon and general practitioner a consultant whose opinion and advice are often invaluable in the determination of the cause of obscure symptoms, and in the decision as to the therapeutic treatment or operative intervention most likely to effect a cure. While the profit side of the specialists account is large, still on the opposite page we find some items of loss. The high esteem in which the specialist is held, the pecuniary rewards which his services com-

mand and the advertising opportunities offered by his position, have made him a victim of imitators and impostors, both inside and outside the pale of the profession, who deceive and defraud the public. Modern medicine is not responsible for the quacks and charlatans, but it is responsible for the members of the regular profession found in every town and city who claim to be specialists, but who really do a general practice, and for others who, while they may limit their work to certain diseases, are not qualified as experts, and have no more knowledge or experience in their diagnosis and treatment than the average general practitioner.

Again the specialist, although an expert, is often narrow in his views and prejudiced in his opinions, so that he finds explanation for every symptom in the derangement of the organs he treats. His patients often suffer from special attention and general neglect. Motes are pulled out of the eyes and beams are left in the belly, or the abdomen is invaded for real or supposed appendicitis and the lungs are left to fight their own battle with tuberculosis.

Finally, the specialist is an expensive friend of both the patient and the general profession. It is an everyday experience for the surgeon or general practitioner to send an obscure case, first to the pathologist for the examination of his blood, urine, sputum, feces or stomach contents, then perhaps in turn to the roentgenologist, the cystoscopist, the ophthalmologist and the dermatologist. The patient goes the rounds submitting his anatomy and functions to exhaustive examinations and reports, and his pocketbook to depletion. The system is not essentially wrong. Unquestionably the patient is better cared for

than formerly. To the well-to-do, while the cost is great, it is not prohibitory. To the poor, the public and private charities are open where they can get the same services, dispensed in less luxurious fashion, but no less efficiently. The real sufferer in the transition stage of rapid differentiation and delayed organization is the great middle class. Caught between penury and pride, without the price to pay, but with the desire to conceal their poverty, they are often limited to an inferior grade of service.

Team work is essential to carry out the modern system of examinations. It is best seen in the staff of a modern hospital where ever patient has at his command the services of specialists in all diagnostic lines. The same principle must sooner or later come into vogue in private practice. Ultimately doctors will have their offices in large buildings instead of at their private residences. Here composite groups will unite in close business and professional association as a firm or corporation. Patients will be treated jointly, conveniently and expeditiously, and a combined bill will be presented through a central office.

Modern Diagnostic Methods.

One of the most wonderful gains made in modern medicine is in the exact diagnosis of disease by laboratory methods. For a time our knowledge of etiology and pathology was vague and indefinite, but one after another, great discoverers have cleared the field and given us definite facts with which to work. Diatheses and dyscrasias, miasmatic and idiopathic diseases are no longer mentioned; the terms scofula, blood poison and typhomalarial fever are no longer employed, and even the

identity of neurasthenia and auto-intoxication are questioned.

We now diagnose the existence of tuberculosis, not by hectic fever, but by the demonstration of Koch's bacillus. We diagnose malaria, not by the therapeutic test of quinine, but by the presence of the plasmodium of Laveran. Widal has given us the agglutination test for typhoid, and Wasserman the reaction which shows the presence or absence of syphilis. The white blood count tells the degree of infection and resistance of the patient, and is not only a test of importance in making prognosis, but often indicates the proper time for intervention. The microscopic examination of tissue differentiates benign from maligant tumors, and in operation for cancer the frozen section will often tell the surgeon when he has reached the limit of the disease. The X-ray shows the existence of fractures and the position of fragments, locates the presence of stones in the kidney, ureter or bladder, and by recent perfection of technique makes moving pictures showing the passage of food from the stomach to the rectum.

The inspection of the modern laboratory is impressive to the visitor. The rows of reagents, retorts and test tubes; the microscopes, centifuges and microtomes; the refrigerators, incubators and culture media; the polariscopes, hematocytometers, sphygmomanometers and other instruments of precision, make a layman, and even some of the profession, think that the work done and the final report made must settle all questions in a given case.

But the laboratory method of diagnosis entails a loss as well as a gain and has its dangers and disadvantages. While it is true that chemical reactions are always con-

stant, that the microscopic field shows the cellular structure of tissue and the physical form of bacteria, and that the X-ray picture truly depicts the shadow of the object between the Crooke's tube and the photographic plate, it must always be remembered that there is a personal and uncertain factor in the result, namely, the laboratory man who construes what he sees. A poor pathologist or Roentgenologist is worse than none at all, and even the opinion of the most experienced and proficient is occasionally wrong.

As valuable as are his services, the laboratory man is sometimes too highly regarded. Seated upon his kingly stool and surrounded by a rarefied scientific atmosphere, he tends to tyrannize the clinician. His reports are too often accepted as final in their decrees and become enervating in their influence. Owing to a tendency to lean too much on laboratory reports, case histories and bedside records, the profession is in danger of neglecting the examination of the patient. Sick people are just as instructive today as in the time of Sydenham, Addison and Bright. Laboratory data and clinical findings must be studied together. They must be compared, and one used to check a possible error of the other.

The Modern Hospital.

The hospital, while an old institution, is modern in its distribution and function. It has lived down its stigma of a death house. It has overcome the prejudices of the masses and appealed to the pride of the classes. Practically every town of five thousand inhabitants has a hospital, and every well-regulated hospital is an asset to its community. A hospital is now accepted as the safest /

most comfortable and most economical place for the seriously sick, and it is also recognized as a local centre for the dissemination of knowledge among the public, the training and education of nurses, and the uplift of the profession by the demands made for good records, thorough examinations, accurate diagnoses and rational treatment.

Many hospitals through a mistaken sentimentality on the part of Boards of Managers refuse to allow clinics to be held in their wards. By this prohibition they do not protect the patients from anything to which they object, but expose them to a possible danger from which they could be shielded. Experience has shown that sick people are egotists, and that the more they are examined and discussed the better they are pleased; also that the greatest safeguard against neglect or improper treatment on the part of the staff, is the knowledge that the work done is under the constant observation and criticism of students and physicians who visit the institution. The hospital of the future should not only care for its patients, but also be a centre for medical research, a stimulus for the understanding visitor, and a training-school for nurses, students and doctors.

The modern hospital, however, is not without its dangers and disadvantages, as it offers opportunity and hence temptation to members of its staff, especially those with surgical ambition, to undertake work for which they are not qualified. The following is a familiar illustration: A small town feels the need of a hospital, the women organize, raise the money and build one. The people of this community had formerly made it a practice to go

to some neighboring city when in need of special medical treatment or a serious surgical operation. They are now urged to patronize the home hospital, and as that course appeals to their desire to help a local institution, and also avoids separation from family and friends, the advice is often followed. For a time an experienced surgeon is sent for to operate on difficult cases, and one of the local practitioners acts as his assistant. The successful result which usually follows in these early cases inspires the community with confidence in the hospital, and in time creates a desire in the mind of the local man to do the work himself. He spends six weeks or three months at a post-graduate school, and returns with a highly embellished certificate. He performs a herniotomy or removes an appendix, and the patient does not die. He comes to be known in the community as a man of wonderful nerve. He hopes later to drop his other work and do nothing but surgery.

The evil goes further. This newly developed surgeon has no regular assistant, and makes it a rule to get the family doctor of the patient to help him with the operation. As the physician does part of the work it seems only proper that he should get part of the fee. When this practitioner has a patient who desires to go to a specialist in a large city, what is more natural than that he should go with him, and explain that he was reluctant to come because of the loss of the financial benefit he was accustomed to receive from such cases at home; or what more human than for the city surgeon to endeavor to meet this competition by offering to split the fee in this and future cases provided it was made sufficiently large; and what more necessary than that this secret understand-

ing between the two be kept from the knowledge of the patient. And so has come about the great modern evil of the secret division of the fee, a practice by which the doctor sells the patient to the highest bidder, and by which the surgeon robs the patient to pay the doctor. Happily this practice does not exist in Virginia, and is limited to a very few communities in the South. Wherever it does occur it is denounced in strong and unmeasured terms by the best element of the local profession.

The evil of incompetency in the shape of the unqualified surgeon, and the vice of dishonesty in the form of the secret division of the fee, are being fought in the profession by the establishment of a special organization known as "The American College of Surgeons." If the remedy is not found, action will be taken sooner or later by an indignant public through State legislation.

THE MODERN TRAINED NURSE.

The advent of the trained nurse marked an epoch in medicine almost equal to the introduction of anesthesia and antiseptics, and the name of the founder of the order, Florence Nightingale, deserves to rank with those of Long, Pasteur and Lister. The rapid and general adoption of the trained nurse was due, not only to the professional needs of the doctor, but also to the domestic necessities of the public. In times past a sick person was nursed by servants and relatives. In every family there were old mammies and old maids who had considerable practical experience in nursing, and who derived a certain morbid pleasure from the temporary authority of the sick room. The modern servant problem, and the recent migration of the unmarried female members of the family

from the home to the office, did away with this supply of amateur nurses, and created a demand for the professional nurse.

At one time, especially in the South, there were but two respectable things for a young woman to do, get married or teach school. Now many avenues are open to them, and of these none is more attractive or offers greater opportunities for service than the field of nursing.

In the early part of the last century the only paid nurse was a servant, without education or technical knowledge. In America today the professional nurse is a woman of good social position, adequate general education and trained in the art of her calling by three years practice and study in a hospital.

Time will not permit an attempt to show the contributions of the trained nurse to the progress of medicine. In every department she has proved a faithful, efficient and trusted worker, without whose aid the end attained could not have been accomplished. At the bedside of the patient in the silent vigils of the night, in the operating room during the stress and strain of nerve-racking ordeals, and today in Europe on battlefields torn with shell and red with carnage, she has shown a courage, a fixity of purpose and a devotion to duty rarely equaled in either sex or in any profession.

The nurse is a woman, and therefore has her faults, but the faults are those of the woman, not of the nurse. If she is sometimes spoiled, occasionally a trifle tyrannical, and more rarely a bit supercilious from real or supposed superiority of knowledge, it shows the weakness of her sex and not of her profession. If her services are

sometimes prostituted to pamper the whims of the neurasthenic invalid, or to indulge the selfish indolence of the idle rich, it is not her fault, but the fault of our present system of living.

THE MODERN MEDICAL SOCIETY.

The medical society is an important factor in the progress and development of medicine. While some members of the profession do not appreciate the advantages to be derived from regular attendance and active co-operation in medical organizations, it is a fact that the busy and successful practitioners are usually present at all the meetings of their County, State and National Associations. This can only be explained by the fact that those of the profession, whose experience and judgment have proven to be the soundest, believe that medical meetings are profitable.

Medical societies usually hold their regular sessions in different cities, and their meetings educate and stimulate the local profession, and advertise to the laity the fact that medicine is not bound by dicta and dogmas, but is a progressive science ready to discard the old, if it is proved to be fallacious, and to adopt the new, if it is found to be of value. The meeting of a medical society enables its members to read papers, thus giving them a legitimate opportunity to show their capacity; and to present new and original views as to the treatment of disease, thus adding to the knowledge of the profession. It enables its members to hear papers read by others, thus giving them an opportunity to gain an amount of information they could get in no other way with so little labor and in so short a length of time. The discussions that

follow these papers are especially profitable. In them is an impressive personal element that is totally lost in the stenographic report published in the transactions.

In addition to the educational and professional advantages derived from these meetings there are equally important social and personal benefits. The occasion is a holiday, a recreation, a vacation. It breaks the monotony of life and enables a man to do better work when he returns home. It offers the opportunity to meet men who are doing the same kind of work in different sections of the country, and results in pleasing and profitable acquaintanceships which often lead to permanent friendships. And last but not least, it brings together men who live in the same community, but who owing to petty jealousies or lack of time for social intercourse, see little of each other. Either in the session of the society, or in the committee room, or on the journey to and from the place of meeting, they are thrown into an intimate contact which frequently leads to explanation of misunderstandings, adjustment of differences, appreciation of good qualities, and to the establishment of the most friendly and cordial relations.

Despite the manifest and manifold benefits of the medical society, it is necessary from the profit to deduct a loss. There are many medical societies which have no right of being, and have been organized simply for political or personal motives. Originally established to give office or secure patronage for a certain group of men, they are often supported for years through a mistaken pride or patriotism on the part of their members, to the great injury of the legitimate societies whose territory they cover. There is need for a movement to standardize

medical associations, and until this is done through the proper channel the profession should try to minimize the evil by withdrawing its membership from superfluous organizations. Leaving out of consideration the societies of the specialists there are but four medical associations entitled to support: the county, the state, the regional and the National. Each organization should be self-governed, but each should have its representatives in the next higher body, and all work together for the common good of the profession and people.

Woodrow Wilson, in speaking of the new banking system, said: "We have developed by regions and there is every reason why we should function by regions." It is because the South has developed as a region and is drawn together by a common spirit that we are met together today. The Southern Medical Association is not a sectional, but a regional society.

Twenty years ago it was considered derogatory to the dignity of one clinician to visit the workshop of another. To do so would be to invite the criticism of a confessed inferiority, or of a desire to spy on the work of a competitor. Then all one practitioner knew of the work of the other was through printed matter, and some things that were true were not believed and some things that were not true were accepted. It has now become almost a custom for the busy surgeon and physician to devote two or three weeks of the period previously assigned for a vacation to the duty of seeing, at first hand, what his fellows are doing. At the various recognized medical centres every provision is made for the convenience and instruction of visiting doctors. No fees are charged and the veriest stranger is made to feel welcome. By actually

observing the methods practiced in these various clinics the visitor is able to decide whether or not they are preferable to the technique he has hitherto employed.

Surgeons, as a rule, attend clinics more frequently than do physicians. This is a pity, for even in a strictly surgical clinic the points of greatest interest are not the methods of operating, but the explanation of symptoms by the pathological conditions found. It is a curious fact that many physicians, who would travel miles to see a post-mortem examination, will not go around the corner to witness an operation which demonstrates the same changes produced by disease in living tissues before they are obscured by terminal results. To correct the loss entailed by the failure of the average physician to avail himself fully of the advantages offered by the modern clinic the internist must learn that to keep abreast of the times it is necessary not only to study but to travel as well.

Europe, in time of peace, may offer peculiar advantages for instruction in medical subjects, but America can truly claim to have the best surgical clinics in the world. Rochester, Chicago, Cleveland, Philadelphia and Baltimore are universally known for their surgical teaching, and some of our Southern cities are beginning to be the objective points of the seekers for surgical knowledge.

Public Health Service.

For centuries the world suffered from pestilence and scourge. People in desperation abandoned themselves to their fate, discarded even the crude laws of the Mosaic Code, and attributed their condition to the visitation of the devil, or the wrath of an offended deity. But medi-

cal men have ever labored to discover the cause of disease, and the means to prevent its occurence. With an altruism rarely approached in other professions the physicians of of the past and the present have given unceasingly of their time and labor to destroy the very source of their living.

Time will not permit a record here of the victories that have been achieved in preventive medicines, beginning with small-pox and now approaching a successful issue in the case of yellow fever, malaria, typhoid and other diseases. The recent completion of the Panama Canal, a task rendered possible only by the sanitary regulation promulgated and enforced by the distinguished member of this association, Surgeon-General Gorgas, stands as an unquestioned tribute and enduring monument to the perfection and efficiency of the measures which modern science has developed for the maintenance of health and the prevention of disease.

The public Health Service is now recognized as one of the most important departments of our general and local government. The work in this service offers the present day graduate one of the most attractive fields open to him. It does not hold out the promise of fortune that goes with rare eminence in private practice, but it guarantees to every worker a reasonable income, the opportunity for scientific study and research, the certainty of performing a useful service for his community, and the possibility of becoming a great benefactor to the human race.

The state and local health boards are securing the service of an increasing number of the best men of the profession who are devoting their time and energies, not

only to sanitation and preventive medicine, but also to an educational campaign to arouse the profession to a sense of its duty as guardian of the public health, and to acquaint the laity with a knowledge of the cause and means of preventing disease. The attendance of these trained workers and practiced speakers at the meetings of our county and state medical societies has already had the effect of raising the value of the papers read, and of making the discussions more interesting and scientific.

Public health work marked the beginning of a new era in the relations between the profession and the public. It was characterized by an effort on the part of the profession to take the public into its confidence. Its purpose was to make the people a partner in the conservation of health. A short time ago if a doctor addressed a lay audience on a medical subject, his motives were questioned. Now the profession employs every agency of publicity to spread the propaganda against disease. The columns of the newspapers and magazines, the walls of public conveyances, the lecture platform, the pulpit, the school and the drama warn and plead against the danger of the mosquito and house-fly, the communicability of tuberculosis, the insidiousness of cancer, and the pathos of "Damaged Goods."

Publicity in medical matters has undoubtedly done good, but it has also done harm, and here as elsewhere we must record not only the profit but the loss.

The first loss is seen in the schools, for an examination of the text-books employed in physiology and hygiene will show that just as at one time the children of the South were taught false history, so now they are often taught false science. Investigation will show that these text-

books are prepared by literary hacks employed by fanatical associations to impress their views on various subjects, especially with reference to the action of alcohol. No one questions the evil of the abuse of this drug, but neither the cause of temperance nor of science is advanced by untruthful statements or manufactured statistics. Another evil in the schools is the attempt to teach sex hygiene. It is a difficult question to decide in an individual case when and how to impart this delicate information. If parents hesitate to discuss the matter with their child at home, it is certainly an evasion of responsibility attended by great danger to turn the subject over to an old maid teacher to deal with in a mixed school.

The second loss from the general information given the laity on medical subjects is seen in its effect on women. Matters are now discussed in a mixed audience with a freedom and frankness that would have been thought unbelievable a generation ago. Beginning with co-education and equal suffrage, subjects suggestive of sex differences, the field of activity of the female mind has broadened, until now the average high-school girl is more or less familiar with the problems embraced under the terms eugenics, race suicide, the social evil, the age of consent, the white slave traffic and the regulation of the red light district.

The woman of today has lost her prudery. Let her beware lest she lose her modesty as well! If such should prove the case it would be necessary to change from the credit to the debit side, the balance now found in "The Profit and Loss Account of Modern Medicine."

Latent and Active Neurasthenia in Its Relation to Surgery *

We have met at this the twenty-second annual session of the Southern Surgical and Gynecological Association, some to learn, some to teach, and all to secure a well-earned vacation, and for a time, at least, be free from the complaints of nervous and exacting patients. This being the case, some of you may think that in choosing as the subject for a presidential address, "Latent and Active Neurasthenia in its Relation to Surgery," I have shown a lack of tact by introducing a topic which brings to mind unpleasant experiences, which for the occasion you wish to forget. I trust this will not be the case, and hope there will be found, if not in what I write, at least in what you read between the lines, something which will be of practical value.

Specialists usually divide functional neurotic disorders into hysteria, neurasthenia, and hypochondria.

Hysteria is a special psychical state often produced in certain individuals by suggestion, and capable of being relieved by persuasion. It is a condition of nervous instability, stigmatized by emotional storms, crises, contractures, and paralyses, by a craving for sympathy, a desire for an audience, and a tendency to pose.

Neurasthenia is a fatigue neurosis due in part to malnutrition, and in part to functional overexertion, occur-

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ring in persons with an hereditary or acquired predisposition. It is characterized by exhaustibility of the nervous system, slight exertion causing prostration and bringing on the various distressing symptoms from which the patient suffers.

Hypochondria is a mental disease marked by obsessions, depressions, and morbid fears concerning the health of the individual. It is not very common, is easily diagnosticated, and is usually incurable.

Hysterical patients give a great deal of trouble before an operation, but do very well after the ordeal is over. A nervous woman who describes her symptoms with hesitating vivacity, who desires to discuss every detail of her operation and subsequent treatment, and who is possessed of exaggerated fears of complications which may develop, or of the ultimate result which may follow, usually, after the operation is over, becomes a model patient. Her imagination enters upon fresh fields; she becomes hopeful and courageous, and begins at once to plan a new life of activity.

Neurasthenic patients usually discuss their cases calmly and logically: they describe their symptoms systematically, and employ technical terms correctly. They complain of nearly every organ in the body. The essential feature of their clinical picture is fatigue, exhaustion, and incapacity for prolonged physical or mental exertion. They suffer from general weakness, headache, backache, and insomnia. Their mental condition is one of hesitation, doubt, and indecision. They do not reach conclusions, and are unable to fix their attention for any period of time. They usually have digestive and sexual disorders, and often grossly exaggerate the importance of

their symptoms. They frequently have psychic depressions, shown by irritability, introspection and selfishness. They are firmly convinced as to the nature of their disease, and come to the surgeon for what they believe to be a necessary operation.

Hypochondriac patients are the victims of what is often a hopeless psychosis. The individual is possessed of the idea that she has some strange and horrible malady. She soon wears out the patience of her family and friends, and in order to secure a sympathetic listener, and to demonstrate to the community the serious nature of her disease, she goes from surgeon to surgeon, and from hospital to hospital, offering herself as a bloody sacrifice to her curious obsession, and glorying in her martyrdom.

As simple hysteria is easily recognized and controlled, and as pure hypochondria is usually unmistakable and incurable, I will dismiss these two subjects and devote the time at my disposal to neurasthenia. I shall not limit the term to the definition given by the scientific neurologist, but shall employ it in the broad sense in which it is used by the practical surgeon. This is necessary because, while in theory it is easy to distinguish between hysteria, neurasthenia, and hypochondria, in practice it will be found that the symptoms of two or more of them are often present in the same patient at the same time. Thus, one writer says all hysterical patients are neurasthenic, but all neurasthenics are not hysterical. Name and classify neuroses as you please, the trail of the serpent is over them all.

None of us want neurasthenics as patients, but all of us have them constantly in our practice. Some of them are referred to us by the general practitioner; some come

to us from other specialists; and some develop their pernicious symptoms under our personal observation and treatment. In deploring the frequency of neurasthenia, and in criticising practitioners in other departments of medicine for the occurrence of the disease, it should be remembered that we, as surgeons, are responsible for the development of a large number of these cases. A surgical operation injudiciously performed, or carried out without proper precautions on a susceptible patient, will frequently be the beginning of a neurosis, and terminate in the condition known as traumatic or surgical neurasthenia.

It is the object of this address, first, to emphasize the importance of refusing to operate on a neurasthenic patient unless the symptoms can be clearly shown to be due to organic disease; and second, to impress the necessity, if an operation is undertaken on a patient with either latent or developed neurasthenia, to protect the nervous system from psychical and physical shock, not only by a proper preliminary preparation, but by careful and often prolonged post-operative and post-hospital treatment.

A surgeon cannot be expected to be an expert neurologist, but for his own happiness, if not for his patient's welfare, he must study functional neurotic disorders, as well as organic diseases. He must learn to know his limitations, as well as recognize his abilities; and to estimate the possible injurious effects as well as the probable beneficial results to be expected from surgical intervention. He must remember that the patient does not come to him primarily to be cut, but to be cured; and that an operation is not a success unless the individual is restored to health, not only physically, but also psychically; not only anato-

mically, but also symptomatically. In surgery the main question is no longer one of mortality, but one of morbidity. In endeavoring to forecast the end results of an operation, the mental and nervous condition of the patient must be carefully considered. If neuroses exist, without anatomical disease, an operation will do no good, and may result in harm. If neuroses are found coincident with pathological lesions, an operation may prove of great benefit; but in relieving the physical disease, care must be taken to avoid increasing the nervous disorder. If neuroses are present, reflex in character and due to remediable causes, an operation may be undertaken with assurance of complete success. In other words, the surgeon should divide these cases into three classes: the first to be avoided; the second to be undertaken with caution; and the third to be cheerfully given the relief to which they are entitled.

Of the class to be avoided, because the neurasthenia has no organic basis, Goodell says: "The sufferer may be a jilted maiden, a bereaved mother, a grieving widow, or a neglected wife, and all her uterine symptoms—yes, every one of them—may be the outcome of her sorrow, and not of her local lesions. She is suffering from a sore brain and not from a sore womb." Here an operation will not relieve, but will aggravate, the symptoms.

Of the class to be undertaken with caution, because the neurasthenia is merely coincident with anatomical disease, it is often a question whether the patient had better endure the evils he has, or fly to those he knows not of. An illustration of where one of our greatest surgical philosophers elected the first course is quoted from Mumford's recent article: "Said John Hunter to a patient

with a chronic running sore who was brought to him for consultation: 'And so, sir, you have a chronic running sore?'

" 'Yes, Mr. Hunter.'

" 'Well, sir, if I had your chronic running sore, I should say, "Mr. Sore, you may run and be damned." ' "

In other cases it may be deemed best to operate—not to cure the neurasthenia, but to relieve the pathological condition. Great care must be exercised to avoid increasing the nervous weakness by the very means used to cure the physical discomfort. This is especially true in patients who have been previously the subject of other operations.

Of the class where the neurasthenia is directly due to anatomical disease, it may be said that if the diagnosis can be made and the cause removed, the patient will be cured. Often the symptoms are obscure and misleading, and much patient investigation will be necessary to reach the proper conclusion. A distinguished modern surgeon relates the following experience occurring in his early professional life. One of his friends developed digestive disturbances and came to see him with periodical regularity. He first treated him along accepted lines; then gave him all the samples of proprietary medicine left at his office, and as he did not improve, he decided that the man was a neurasthenic. One day he was hurriedly called to see him, and found that he had acute appendicitis. He operated on him, and hoped that by taking out the appendix he had not only relieved the immediate danger, but had also removed the cause of his previous symptoms. Much to his disappointment, the patient, after leaving the hospital, complained as before, and he was

therefore confirmed in his opinion that he was a neuras-
thenic. Later, the patient developed jaundice and symp-
toms of cholecystitis. He was operated on a second time
and a number of gallstones removed, and it was again
hoped that the cause of his trouble had been diagnosti-
cated and relieved. Before he left the hospital, however,
he began to have his old pains, and then the surgeon said
he knew he was a neurasthenic. Despite his failure to se-
cure relief, the patient persisted in coming to the office,
and one day called just after the installation of an x-ray
apparatus. More to test the new instrument than with any
expectation of benefiting the patient, a skiagraph was
made of his abdomen, and it was found that he had a
stone in his right kidney. A third operation was per-
formed, the stone removed, and from that time to this
the patient has been absolutely well. This is not a unique
case. All of us have had similar, if not quite such aggra-
vated, experiences. The story is told to impress the fact
that even an apparently hopeless neurasthenic should not
be condemned without a trial, as some of them may be
cured provided a correct diagnosis is made.

The means employed by surgeons to distinguish be-
tween hopeless and curable neurasthenia cover the entire
field of diagnostic medicine, and cannot be discussed. The
precautions to be observed in operating on a patient who
is likely to develop neurasthenia will now be considered.

Two separate and independent preliminary examina-
tions should be made of every surgical patient: the first
for the purpose of diagnosis, or the determination of the
condition to be corrected; the second for the purpose of
prognosis, or the determination of the safety of the opera-
tion, and the probability of a complete cure resulting

from it. To do this satisfactorily it will usually be found necessary to secure the aid and cooperation of several specialists. Few busy surgeons have the time or skill to make the necessary physical examination of the heart and lungs, or the laboratory investigation of the urine, blood, and stomach contents, to say nothing of the special work which is sometimes required of the bacteriologist, ophthalmologist, neurologist, röntgenologist, and other experts. Patients will not object to frequent and prolonged examinations, but will be inspired with confidence in the surgeon by the realization that nothing is taken for granted, and that every effort is being employed to ascertain the nature of their trouble and the best method to effect a cure. In fact, the laity are now so educated in medical matters that failure to give a case a thorough preliminary examination is a cause for criticism and distrust.

An important exception to this, however, is in the case of a young, unmarried woman who complains of pelvic symptoms. She may be of neurotic temperament, and, owing to backache and painful menstruation, become convinced she has uterine or ovarian disease, when, in fact, she has no local trouble. On the other hand, she may have cervical stenosis, uterine displacement, or ovarian cystoma. In such a case a physical examination should be made to ascertain whether the trouble is neurological or gynecological. In order to minimize the psychical shock and to avoid physical pain, the examination should be made under a general anesthetic. If her symptoms are found to be due to some defect of her nervous system, she should be positively assured she has no local lesion, and be referred to a suitable attendant for general

treatment. If, on the other hand, her symptoms are found to be due to actual disease of the pelvis, she should be given the surgical relief her case demands. Noble has emphasized the fact that virgins rarely suffer from traumatism and infection of the genital organs, and when pathological disease exists they almost invariably demand operative treatment. Repeated examinations, local applications, and other manipulations do them little good, and often convert them into chronic nervous invalids. The "pelvic woman" of the old author is the "sexual neurasthenic" of the modern writer.

The preparation of a patient for operation should be both physical and psychical. In the past much attention has been paid to the first, and but little to the second. We now recognize that we have overdone starvation, purgation, and sterilization, and have neglected to study the patient's mental attitude to the operation, in order to lessen apprehension, if it is unduly present; to inspire confidence, if it is lacking; and to lay the foundation for a philosophy which will be needed during convalescence.

The surgeon's first efforts should be directed to relieving the patient's dread of going to the hospital. The laity are being rapidly educated to a just appreciation of the advantages afforded by such institutions, but some people still regard them as a cross between a prison and a pest house. The easiest and most effective way to overcome this belief is to induce the patient to enter the hospital several days before the date fixed for the operation. In the environment of a well regulated sanatorium excitement and fear will soon be replaced by calmness and hope.

The surgeon should see the patient daily. His bearing should be kindly but not oversympathetic. The patient

should not be the object of commiseration because of the anticipated operation, but the subject of congratulation because her case is one that can be cured by surgery. She should be made to realize that operations are but an incident in the day's work, and that, while her case will receive all needful attention, she is not the most important individual in the hospital. Care should be taken, in talking to her, not to magnify the importance of her lesions or the difficulty and danger incident to their correction. The relatives and friends should, of course, be informed of the facts in the case, but the patient should not be burdened with doubts and fears. It is also well to avoid giving unnecessary information about the etiology and pathology of her disease, or to describe the different methods by which her abnormality might be corrected. While she will listen eagerly to any statement with reference to her case, and will enter into a discussion of what is best to do for her, she realizes that she does not fully comprehend what has been said to her by the surgeon, and is worried by the responsibility she has assumed in the opinion she has expressed to him.

It is, however, important at this time that the surgeon warn the patient against certain symptoms, complications, and sequelæ which may develop after the operation, telling her that while they entail no danger and will not effect the final result, it is well that she should realize their possibility, in order that, if they develop, she may know they were foreseen. For instance, a patient to be operated on for hemorrhoids should be told that possibly she will require catheterization for a day or two; a patient with a goitre, that her throat will feel sore, and it will hurt her to swallow; a patient with gallstones, that a

drain will be used for a week or ten days; and a patient with fibromyoma of the uterus, that artificial menopause will follow, with symptoms such as usually occur at the "change of life." A word of warning before the operation will be found to be worth more than an hour's explanation afterward to prevent discouragement from ordinary sequelæ, whose significance and importance are not understood.

Finally, the patient's fear of the anesthetic should be relieved by reassurance, reason, or ridicule. A badly frightened patient should never be sent to the operating room. Psychical shock is a greater factor than traumatic shock in the production of surgical neurasthenia.

Some patients are in good nervous and physical condition and require practically nothing but the mechanical correction of a local trouble. Others are as bad off nervously as they are physically, and often will be more benefited by a modified form of rest cure than by the operation itself. Most surgeons recognize this fact, but are often unable to carry out the principles of seclusion, rest, full feeding, bathing, massage, and electricity, as taught by Mitchell, because of the present attitude of the public to surgery. Not many years ago an operation was considered, in the words of the marriage ceremony, as something not to be entered into unadvisedly or lightly, but discreetly, soberly, and in the fear of God. Today it has come to be regarded as a comparatively trivial event, and the principal dread is the surgeons fee. In the old days it was understood that a patient requiring a serious operation would have to remain two or three months in a hospital. At present patients enter the hospital one day, are operated upon the next, begin to ask when they can go home

before they stop vomiting, and usually are permitted to leave before it is wise for them to do so.

Nearly all surgeons admit the injurious results which frequently follow the premature discharge of a case from the hospital, but most of them try to evade responsibility by attributing the evil to the unreasonable insistence of the patient to be permitted to return home. The fault, however, is not with the laity, but with the profession. Patients would consent to longer detention in the hospital just as submissively today as they did some years ago, if they believed it to be necessary. The fault is with a few surgeons who, for various reasons, have entered into a competition to see who can get their cases out quickest, and have thereby set a precedent which others have followed. Some have been actuated by a desire to save the patient time and money; others by a desire to advertise themselves. The public is prone to estimate the ability of a surgeon by the apparent rapidity of the recovery of his patients, and to make comparisons between different operators on the basis of the length of time they keep their patients in the hospital. This is not surprising, as even some of the profession do not seem fully to realize that, all things being equal, a wound will not heal quicker for one man than it will for another, and the number of days a surgeon keeps the patient in bed is not a measure of his surgical dexterity, but of his surgical judgment.

In order to appreciate the dangers to a patient of premature discharge, it is necessary to contrast the conditions of hospital and home life. The change is as decided and the influence as great to either sex, the man on returning home being confronted by financial obligations and

business complications, and the woman by family cares and domestic duties.

By way of illustration, we will take the case of a woman. While in the hospital she is free from responsibility, and has comforts and conveniences which are often as new as they are delightful. Her room is clean and well heated; dainty meals are served with clock-like regularity; and an electric bell commands the services of an attractive and efficient nurse. Other patients recovering from more serious operations inspire her with courage, and she emulates their example and tries to surpass them in rapidity of progress. It is like playing a game to see who can get well first. Above all, she is conscious of being under the watchful eye of the surgeon, and appreciates the fact that complications, if they occur, will be promptly corrected.

Now compare the condition of this woman when she returns home. At the very outset she has to meet either injudicious sympathy or unreasonable expectations. Sometimes her friends and relatives, by a combination of commiseration and indulgence, induce her to believe that she has been the most unfortunate woman on earth, and is therefore entitled to lead a life of invalidism for the remainder of her existence. Or, again, her husband and family may show in their manner, if they do not express it in words, the conviction that she ought to be in good working order after so much money has been spent in repairing her, and, as a result, she feels impelled to exert herself to discharge duties for which she is not physically competent. During the woman's absence from home the domestic economy often gets sadly out of gear. Undesirable relatives have come to make visits; servants

have grown slack and impudent; children have been spoiled and pampered; and the husband's sexuel appetite has not been gratified. As a consequence, in the first few days after her return, she has to snub her mother-in-law, discharge her servants, clean her house, cook her dinner, spank her babies, and resist or yield to her husband's advances.

If she lives in the country, as is often the case, the contrast between hospital and home life is even greater. The house is often inadequately heated; servants are generally unreliable and incompetent; food is usually indigestible in character and monotonous in variety; outdoor exercise is difficult to practice; a bath can only be obtained by bringing in a wash-tub and heating water in a kettle; and an evacuation of the bowels can only be effected by an excursion to the garden, along a grass-grown path overhung with boxwood bushes, and by the exposure of a vulnerable portion of the anatomy to the chilling wintry blasts. Is it a wonder that the woman becomes neurasthenic and fails to get well?

What has been said with reference to the short stay of patients in the hospital, and the conditions which frequently exist at home work adversely to their recovery, makes it plain that those interested in their welfare should thoughtfully consider the situation and endeavor to remove the evil. The remedy obviously consists in the patient's remaining longer under the care of the surgeon, and on returning home being placed under the close supervision of the family physician.

A patient should not be detained an unnecessary time in the hospital, as it is not only a waste of the individual's time and money, but also tends to the creation of

invalidism. A patient should not be dismissed too soon, as failure to secure the expected benefit from the operation may lead to discouragement, which finally results in well-established neurasthenia. Convalescence is a question of temperament, and must be psychical as well as physical. People are coming to regard surgeons as mechanics, and patients as machines which are to be repaired. They must be taught that the operation is not everything, and that the after-treatment is often of equal importance. They must be made to understand that the operation merely corrects an abnormal condition and puts Nature in a position to effect a cure; that often the first effect of an operation is injurious, and that the beneficial results are only experienced after the system recovers from the shock and readjusts itself to new conditions; that sometimes it takes weeks, months, or even years for this to be accomplished. They must be impressed with the fact that surgical patients are not well because their wounds have healed, but should remain in the hospital until they have regained to a certain extent their physical strength and nervous equilibrium, and that, after returning home, for a time they should lead a life of prudence and restraint.

The surgeon usually attempts to direct the treatment of patients after they return home by giving them verbal instruction when they leave the hospital, and by subsequently corresponding with them, but the end desired can be more effectually and properly secured by referring the patient back to the family physician. The reason verbal instructions are not satisfactory is because they cannot cover all eventualities, and are frequently not understood. When a surgeon takes charge of a new

case he is on his mettle both to make a good impression and to solve the diagnostic problems presented. Consultations are usually held with other members of the staff, and for a day, at least, the case receives more attention than any other patient in the hospital. The diagnosis made, the operation performed, the danger period passed, and convalescence established, it is only natural that the surgeon's time and thoughts are occupied with more recent cases, so when the time comes to say good-bye and give parting instructions, he simply utters a few perfunctory injunctions, tells her to be patient and prudent, and to write him if she has any untoward symptoms. The patient's expectation and disappointment are often apparent, but she hesitates to ask the many questions which are uppermost in her mind for fear of wearying or irritating the busy man, the value of whose time she has been taught to respect.

The reason subsequent treatment by mail is not satisfactory is because patients usually fail to give important facts, and either exaggerate or underestimate their symptoms. Also, because the surgeon cannot remember their idiosyncrasies and peculiarities, and even if he prescribes correctly, his advice lacks the personal element of suggestion which is so essential to make it efficient.

How much better it would be if the patient were examined before she left the hospital, and told that the operation which had been performed had satisfactorily corrected the condition which had given rise to her symptoms, but that she was not well and that it would require some months of proper living to restore her to full health and activity. She should be directed, on returning home, to place her case in the hands of her

family doctor. This would safeguard the patient's future welfare, and would overcome to a large extent the growing feeling on the part of the general practitioner that he is not always fairly treated by the surgeon. Few surgeons are willing to turn patients over to a physician immediately after a serious operation. Complications are often so sudden and dangerous, symptoms so slight and misleading, diagnosis so difficult, and correct treatment so essential, that no one except a man who has had long and constant experience in the management of this special class of cases is competent to have charge of them. When, however, the danger of the operation is over, and the subsequent treatment consists in regulating the various functions of the body, restoring lost flesh and strength, and reëstablishing nervous and mental equilibrium, the family physician becomes the safer adviser.

With the rapidly increasing amount of surgery and the consequent number of convalescent patients under treatment, an educational move ought to be instituted for the study of the many peculiar factors involved. Papers ought to be written and discussions ought to be participated in by both surgeon and family doctor, taking up the various details and discussing them from their different standpoints, until finally there is evolved a consensus of opinion with reference to the very many important points in the treatment of these patients. These should include the question of a proper dietary; of the best method of regulating the bowels; of treating bladder irritation; of the number of hours of sleep, and of the necessary periods of rest during the day; of the amount of exercise that is permissible, whether steps are injurious, how soon the sewing machine may be employed,

or house work taken up; the question of driving, riding horseback, dancing, swimming, and athletic contests; the sort of clothing to be worn, whether corsets are injurious or an abdominal binder necessary; the question of prudence at menstrual periods and the relief of pain often experienced at that time; the treatment of headache, the administration of tonics, nervines, and hypnotics; the use of baths, massage, and electricity; the protection of wounds; the employment of douches; the use of tampons; the period at which sexual relations may be resumed—these and a hundred other questions all require consideration in order that they may be settled.

When surgeons appreciate the influence of neurasthenia on the result of an operation, and the influence of an operation on the production of neurasthenia; when the family physician is educated in the details of posthospital treatment and given legitimate work with proper compensation, then and not until then will there be harmony in the profession and the greatest good accomplished to the greatest number of patients.

Evolution of the Treatment of Ectopic Pregnancy *

The subject of ectopic pregnancy seems to have exercised a peculiar fascination for the medical mind. Since its recognition in the eleventh century men in all countries have given it much study.

At the outset it is well to recall the fact that rupture of the tube usually occurs between the eighth and twelfth weeks. If this danger period be passed, the problems of treatment are quite distinct from those in the early stages. In the late cases nature sometimes attempts a crude surgery of her own, and spontaneously delivers the fetus by rupture into the rectum, through the abdominal wall, or into the bladder. As far back as the fifteenth century we find the surgeons of that day operating to facilitate delivery by these erratic routes. Primrose, in 1594, was the first to undertake section of the abdomen for this purpose. But he, too, had a natural suggestion hardly to be overlooked; for his patient, three years before, had suffered from the same condition, and the sac had ruptured through the abdominal wall. The first American surgeon to perform this operation was John Bard, of New York, in 1759. The second was William Baynham, of Virginia, who, in 1791, operated successfully upon the wife of a planter; and in 1799 did another upon a negro servant. His work earned for him title to a high

place on the roll of those country practitioners whose sturdy self-reliance has so often done honor, not only to themselves, but to their profession.

In 1842 William Campbell, of Edinburgh, published a work on the subject, presenting an exhaustive review of the literature up to his time. It did not, however, contribute materially to the evolution of the treatment in the early stages. For forty years yet the profession was to wander in a barren wilderness of half-hearted surgical measures. The following review of these attempts exhibits at once their desperation and their futility.

1. *Destruction of the Ovum Through the System of the Mother.*—Von Ritgen, in 1840, advised starvation and purgation. Cazeaux, in 1861, advocated copious and repeated bleeding. Keller, in 1872, urged the administration of iodide of potash and mercury. Janvrin, in 1874, gave ergotin hypodermically. Barnes, in 1874, suggested large doses of strychnia, and later advocated syphilization.

2. *Puncture of Fetal Cyst.*—James Y. Simpson, in 1864, punctured the fetal cyst through the vagina, and evacuated the liquor amnii. The patient died after two days. Hicks, in 1865, punctured the cyst and attempted to destroy the fetus by direct violence. The patient died from internal hemorrhage on the fifth day. Greenhalgh, in 1867, punctured the cyst through the vagina. The patient did well for three weeks, then had a chill, abdominal pain and a bloody vaginal discharge. Finally, she passed clots and membranes and recovered. Tanner, in 1867, reported a similar operation. His patient was desperately ill for three weeks, and then passed the decomposing fetus through the rectum. Martin reported

puncturing the cyst through the skin of the abdomen. The patient died. Thomas, in 1875, reported having punctured the cyst in two cases. Both died, one from hemorrhage and the other from septicemia.

3. *Removal of the Embryo by Section of the Vaginal Vault with the Galvanic Cautery.*—T. Gaillard Thomas, of New York, in 1875, advocated and practiced this method. He opened the sac, removed a three-months' fetus, but, in attempting to get out the placenta, had bleeding and was forced to abandon the operation and to inject subsulphate of iron to stop the hemorrhage. The woman recovered after a stormy convalescence.

4. *Galvanism and Electricity.*—Bachetti, in 1857, reported that he had destroyed a fetus by inserting needles into the cyst, and passing through them an electromagnetic current. Cazeaux, in 1861, suggested using electric shocks. Hicks, in 1866, placed one pole in the vagina, the other on the abdomen, and passed a galvanic current. The fetus was not killed. Barnes, in 1874, used miniature lightning shocks by means of a Leyden jar, one pole introduced into the rectum and the other into the vagina.

5. *Injection of Narcotic Substances into the Cyst.*— Joulin, in 1863, suggested the hypodermic injection into the cyst, through the vagina, of morphia or some other narcotic agent to kill the fetus. Friedriech, in 1864, claimed to have cured a case by this method; but from the history he gives, it is doubtful if the patient really had ectopic pregnancy.

6. *Compression of the Cyst.*—Malin proposed to destroy the fetus through severe and prolonged compression of the abdomen by means of sand bags.

During all this time the abdomen was being opened for other purposes; ligatures for the control of hemorrhage were in common use. But the very magnitude of the catastrophe seemed to cause the profession to view from afar the rational method of treatment. In 1849 Harbert hinted at the possible value of the "Caesarean operation." Again, in 1866, Stephen Rogers, of New York, ventured to renew the suggestion. But not until the seventies did opinion begin to take real shape. Brown in 1870, Routh in 1871, Playfair, Meadows and Darby, of South Carolina, 1872, all wrote advocating what was then termed "gastrotomy." Spencer Wells and other leading abdominal surgeons of that day, however, refused to carry out the suggestions; and Parry, in 1876, was led to lament "But no person has yet performed gastrotomy for the relief of this accident." The uncertainty of diagnosis, and the fear of not being able to arrest the hemorrhage after the abdomen was opened, stayed the hand of that generation.

In 1876 John S. Parry, of Philadelphia, collected and analyzed 500 cases of ectopic pregnancy. Of these 336 died and 163 recovered—a mortality of 67.20 per cent. The recoveries were due, not to primary operation, but to rupture of the sac externally. The percentage of recoveries (32.8 per cent) is larger than would be the case in a similar series today without operation, because in Parry's time many of the early fatal cases were unrecognized, and most of the late abdominal cases were recorded. Parry was not a surgeon, but his studies led him to a clear conviction of the treatment to be followed in the early cases, both before and after rupture. Being himself convinced, he voiced an appeal so clear and strong

that the profession, in the person of Lawson Tait, was inspired to a grapple with the death-dealing emergency. But let Parry speak for himself:

"From the middle of the eleventh century, when Alubcasis described the first known case of extra-uterine pregnancy, men have doubtless watched the life ebb rapidly from the pale victim of this accident as the torrent of blood is poured into the abdominal cavity, but have never raised a hand to help her. Surely this is an anomaly, and it has no parallel in the whole history of human injuries. The fact seems incredible, for if one life is saved by active interference it may be triumphantly pointed to as the first and only instance of the kind on record. In the whole domain of surgery—for we cannot look to other than surgical measues under the circumstances—there is now left no field like this. In this accident, if in any, there is certain death. How often do we see persons recover from injuries which their surgeons tell them will be mortal if they do not submit to a grave and terrible operation?   .   .   .   But in rupture of an extra-uterine fetal sac, in the early stages of pregnancy, a whole lifetime—a whole century—is not enough to enable one person to make two errors in regard to the prognosis of this accident. .   .   .   .   .

"The only remedy that can be proposed to rescue a woman under these unfortunate circumstances is gastrotomy—to open the abdomen, tie the bleeding vessel, or to remove the sac entire.   .   .   .

"The question is not, Will the patient die after the operation? It is, Will she live if abandoned to nature? This was answered in the sobs and sorrows of stricken households long ago.   .   .   .

"This operation, therefore, appears to be feasible, at least, no one has demonstrated its impracticability, and in these days when Durham removes the kidney, Pean and Koeberle the spleen and Billroth the larynx successfully, this procedure ought to be tried."

In Lawson Tait's book on Diseases of Women and Abdominal Surgery, published in 1889, we find recorded

the response to Parry's appeal. He tells the story of a case to which he was called by a Mr. Hallwright, who had already made the diagnosis of ruptured ectopic gestation. Tait says:

"This gentleman made the bold suggestion that I should open the abdomen and remove the ruptured tube. The suggestion staggered me, and I am ashamed to say that I did not receive it favorably. I saw the patient again, in consultation with Mr. Hallwright and Dr. James Johnson, and again I declined to act upon Mr. Hallwright's request, and a further hemorrhage killed the patient. A post-mortem examination revealed the perfect accuracy of the diagnosis."

Emboldened, or, to use his own expression, shamed by this incident, on January 17, 1883, Tait opened the abdominal cavity for ruptured tubal pregnancy. The first operation was unsuccessful. He refers to this case as a bitter disappointment, attributing his failure to overcaution and time-consuming work. But, within the next six years, he had reported 39 cases, with only two deaths. Truly, through disappointment and failure, did he achieve a triumph.

It is interesting to note the different positions taken by Parry and Tait on the question of diagnosis. Parry stated as the greatest impediment to the adoption of the treatment he urged, the uncertainty of diagnosis. Tait said: "The diagnosis of tubal pregnancy at the time of rupture may be made with certainty seven times out of eight, and may be guessed at in the eighth instance." He is equally postive in his skepticism of the diagnosis before rupture. "Much discussion," he says, "has taken place of late years as to the possibility of diagnosing tubal pregnancy before the period of rupture, and many

strangely dogmatic assertions have been made to the effect that such cases have been diagnosed and effectually treated. I am bound to say that I am exceedingly skeptical concerning the correctness of these statements." On the other hand, Parry, while recognizing the difficultues, believed "that it may be discovered at a much earlier date than is generally supposed," and that "a more extended clinical experience would probably show that the existence of misplaced gestation can be detected quite as easily, if not more easily, than normal pregnancy in its early stages." This phophecy of Parry's was not slow of fullfillment. In the early eighties Joseph Price, a native of Rockingham County, Virginia, and a pupil of Tait's, turned his attention to the subject. His masterful presentation of the symptomatology and course of the disease put the diagnosis within the power of the general practitioner.

With Price the history rests. Problems still face us, but the condition was mastered when Parry, Tait and Price had finished their work.

So much for the evolution of the modern surgical treatment of ectopic pregnancy, because of its historical interest. Now for a brief discussion of some of the still unsettled questions, because of their practical importance.

1. *The Question of Drainage.*

This should be decided by the special indications in the individual case, but more often is governed by the practice or prejudice of the operator. All surgeons drain some cases, but some surgeons drain all cases. The ability of the healthy peritoneum to take care of a large

quantity of free blood is being more generally recognized, and injurious irrigation and useless drainage of the abdominal cavity are now rarely employed. In a case of ruptured tubal pregnancy, unless there is evidence of pelvic infection, the wound may be safely closed without drainage.

2. *The Question of Saving the Ovary on the Affected Side.*

This is not a question of principle, but of practice. We all know that a healthy ovary should not be removed; but many of us in the stress of critical operations, clamp and remove the ovary with the tube as the quickest and easiest way of dealing with the situation. In many cases there will be no reason to regret the method practiced, but in other cases there will be cause for regret and condemnation. If disease develops in the remaining ovary, requiring a second operation for its removal, the woman is made sterile, suffers from premature menopause, and frequently becomes the victim of hopeless neurasthenia.

3. *The Question of Immediate Operation.*

All surgeons agree that an operation should be done on a case of unruptured tubal pregnancy as soon as the diagnosis is made. Instances are so numerous of rupture occurring while the patient was waiting to go to the hospital, or, while in the hospital, waiting for the surgeon to come, that it is now the universal practice to operate on these cases with the greatest promptness. There is, however, a serious difference of opinion among the best surgeons as to when to operate on a case *after* rupture occurs. One school advises an immediate operation

to arrest the bleeding, claiming that 5 per cent of all cases will die from primary hemorrhage, and if the patient escapes this danger, a fatal secondary hemorrhage may occur at any time. The other school advises waiting until hemmorrhage ceases, reaction takes place, and the operation can be done under more favorable conditions. They admit that 5 per cent of the patients will die, but claim that these cases would not be saved unless the surgeon was present at the time of the accident and operated with a "jack-knife and shoe string;" and maintain that the greatest good to the greatest number is achieved by waiting for an opportune time to do the operation. This question has been so often fought out on the floor of medical meetings, such as this, that most of my audience have formed a definite opinion, which is not likely to be changed. I wish to go on record, however, as favoring an immediate operation, not only because it is in accord with general surgical principles, but also because, in personal experience, I have seen the practice save apparently moribund patients.

4. *The Question of Removing or Ligating the Opposite Tube to Prevent Repetition.*

The frequency with which a woman, after being operated on for pregnancy in one tube develops the same condition later in the other tube, makes it necessary to consider the advisability of removing both tubes at the first operation to avoid a repetition, which the pathologic tendency of the patient, as well as clinical experience, makes probable.

The removal of both tubes would not add appreciably to the danger of the operation, would not interfere with

the function of menstruation, and would not increase the chance of distressing physical or nervous sequalae. It would simply render the woman sterile. But is this desirable? To secure a postive immunity, have we a right to sacrifice a possible maternity? This involves two questions. First, what proportion of women operated on for tubal pregnancy have a recurrence in the remaining tube; and what per cent of women after such operation become normally pregnant and give birth to a living child? Second, what is the danger of an operation, and what is the value of a baby?

The first question can easily be answered by compiling statistics. The second is almost impossible of solution, as there is no basis for comparison.

In 1911, Smith, of Grand Rapids, tabulated 2,998 operations for tubal pregnancy, in which recurrence followed in 113 cases, or 3.8 per cent. He believed this percentage was too low, as he thought it was impossible to follow up such cases accurately over a sufficient period of time to get final results. His investigation as to normal pregnancy following the operation was even unsatisfactory. In thirty of his own cases, three had borne children since the operation, one being pregnant in utero at the time of the operation. He concluded that normal pregnancy followed less frequently than might be expected.

Essen-Moller, of Lund, after reviewing fifty-six cases of ectopic pregnancy of his own, and the reports of others, concluded that intra-uterine pregnancy may occur after recovery from tubal gestation without operation in the proportion of 46 to 100; and further, that there seemed to be no difference in this respect between the patients operated on and those not operated on, except

that drainage after ectopic gestation tends to make the occurrence of intra-uterine pregnancy afterward less frequent.

I have recently reviewed the case histories of the last fifty cases of tubal pregnancy operated on in my private hospital. Six of these patients have had recurrence in the remaining tube. This I know, for I did the second operation myself. There may be other cases in the series who went elsewhere for treatment and who would add to this 12 per cent of repetition.

I have tried to ascertain how many of the patients operated on for tubal pregnancy subsequently became normally pregnant and gave birth to a child. The result was very unsatisfactory. One patient never had a husband; another became a widow shortly after leaving the hospital; some could not be located; others would not answer, etc. I know, certainly, that seven have borne one, or more, children; and I believe the number would be doubled if I could get the true figures.

Smith, the author previously referred to, believes that before an operation for tubal pregnancy the patient should have the situation explained to her, and she should decide whether or not the opposite tube should be removed. But a woman just before an operation for ruptured ectopic pregnancy is in no condition to understand or settle a complicated proposition. If she decides either for or against the removal of both tubes she may regret the responsibility of the decision, fearing, on the one hand, a repetition of the former accident, or indulging on the other in morbid longings for a child whose advent she has caused to be made impossible. The operator should settle the question for himself without taking the

woman into consultation, remembering all the time that a surgeon's and a patient attitude to an operation are often very different, and that their estimate of the desirability of a baby is often very far apart.

Personally, I am opposed to the removal of the opposite tube, unless it is obviously hopelessly diseased. If, by leaving it, I have subjected some patients to a second operation that might have been avoided, I have equally certainly allowed to remain possible the birth of some babies that otherwise would not have come into existence. As a surgeon I fear operations little and as a bachelor, I value babies highly.

Cornual Pregnancy, With Report of a Case *

Much has been written with reference to tubal pregnancy, but little attention has as yet been paid to cornual pregnancy. A recent mistake in diagnosis which led me to operate on a bifurcated uterus about to rupture from pregnancy in one of its horns has interested me in the subject, and I wish to report the case and briefly discuss the condition.

Mrs. S.; aged 28; married for eighteen months; history of one miscarriage.—Patient began to menstruate at the usual age and her periods were regular and natural. Her general health was good and she had no reason to suspect that she had any uterine or other pelvic trouble. In March, 1902, she missed a period and shortly afterward began to pass blood in small quantities at frequent intervals from the vagina. Three months later she was suddenly seized with severe pain in the lower right abdomen. The pain was characterized as cutting or tearing, was attended by nausea and faintness, and confined the patient to bed. The patient's regular medical attendant was sent for, who stated that he thought the trouble was tubal pregnancy and advised an operation. Several days later the case was transferred to me.

I found the patient in bed, suffering with paroxysms of pain and passing blood from the vagina. The abdominal walls were rigid, but on making a bi-manual examination I succeeded in palpating a soft but elastic mass to the right of the cervix, which corresponded exactly in tactile impression and in anatomi-

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* Read at a meeting of the Tri-State Medical Association of Virginia and the Carolinas, Columbia, S. C., February, 1903.

cal location with cases of unruptured tubal pregnancy I had previously diagnosticated. I stated that I agreed with the opinion of my predecessor; that I thought the case was un- doubtedly one of extra-uterine gestation, and I advised im- mediate operative intervention. The patient was moved to my private sanatorium and as soon as the necessary preparations could be made the abdomen was opened.

The uterus I delivered through the wound was the queerest specimen I ever saw. But for the fact that as a boy I had dis- sected many cats and was familiar with the double horned uterus found in the female of that animal, I would have been at a loss to recognize the condition with which I had to deal.

The uterus was cleft from fundus to cervix; the two di- verging sides tapering to, and terminating in, the Fallopian tubes. The left horn was flaccid and empty, but the right was distended by a swelling until its walls were so thin that they were transparent. Evidently the case was one of cornual preg- nancy, with imminent danger of rupture. In deciding what to do I realized I had three alternatives. First, I could return the uterus, suture the abdominal wound, and endeavor to pro- duce an abortion. But this was deemed unsafe, as the uterus might not have sufficient contractile power to expel its con- tents, or if it did, would probably rupture its walls in the attempt. Second, I could incise the pregnant horn, turn out the embryo, and suture the incision as in a case of Cæsarean section, but this entailed danger of sepsis, and even if success- ful would leave the woman in a position to become pregnant again. Finally, I could do a complete hysterectomy, thereby not only relieving the present situation, but also preventing future complications. The last plan was adopted. The ovarian and uterine arteries were ligated on each side, and the uterus removed.

The patient made a rapid and uneventful recovery and is now in perfect health.

My post-operative study of available literature in re- gard to cornual pregnancy has been unsatisfactory. What has been written is to be found either as practical points

under descriptions of uterine malformations or as incidental allusions under the treatment of tubal gestation.

Cornual pregnancy is not an extra-uterine pregnancy, but a true uterine pregnancy, which, by malformation of the uterus, has become pedunculated and walled off from the main uterine cavity. The malformation of the uterus is congenital and due to imperfect fetal development. The Fallopian tubes, uterus, and vagina are formed from two embryonal structures called the ducts of Muller. These ducts become fused first at their lower ends. Sometimes one duct fails to develop, so that the uterus becomes one sided or one horned—the *uterus unicornis*. Sometimes the ducts may unite only as far as the top of the vagina, thus two distinct uterine bodies resulting, the double uterus—*uterus didelphys*. Sometimes the ducts may unite externally to form one uterine body, but there is no fusion of the cavities, which open separately, the *uterus bicornis duplex*.

Sometimes the ducts may unite to form a normal cervix, but the upper part of the body of the uterus is bifurcated and the two sides diverge sharply from each other, resulting in the two horned uterus—the *uterus bicornis unicollis*.

Sometimes the ducts may unite throughout, but externally on the fundus there is a slight depression, demonstrating the imperfection of development and giving the organ the conventional heart shape—the *uterus cordiformis*.

Finally the ducts may unite so that the uterus presents externally a normal appearance, but contains a septum which divides its cavity into two compartments—the *uterus septus*.

The result of impregnation of an imperfectly developed uterus depends on the degree of malformation, and the site of implantation. Often full term gestation is impossible, no matter what the location of the embryo. Again, in an unequally developed uterus pregnancy in one horn would probably go to term, while in the other horn it would certainly terminate in abortion or rupture. Impregnation of the two horns at the same time or at different times is possible, leading to superfetation. Ross, of Brighton, reports a case in which a patient miscarried of twins and three months later was delivered of a healthy, full-term child. Careful examination showed the existence of a complete double uterus, each side of which had been impregnated. This woman had formerly given birth to six living children and nothing remarkable had been observed at any labor.

Symptoms in cornual pregnancy are absent when the impregnated horn has sufficient capacity to accommodate the growing fetus. Symptoms are present, however, when pregnancy occurs in a horn of the uterus too rudimentary to fulfill the task imposed upon it. The symptoms consist of intermittent pain, due to the contraction of the muscular coats of the uterus; bleeding from the vagina, due to the detachment of the decidua in the unimpregnated side; and, finally, either abortion from discharge of the contents of the pregnant horn into the uterus, or intra-abdominal hemorrhage due to rupture of its over-distended walls.

Kelly, in his work on *Operative Gynecology,* states that an accurate diagnosis of cornual pregnancy is always difficult to make. If the case is seen after rupture there will usually be no time to do more than determine that

there is intra-pelvic hemorrhage, due to an abnormal pregnancy. If the case is seen before rupture two signs will be of value, the first that the developed side deviates at an angle of from 40° to 60° from the normal position; the second, that the pregnant horn is found by rectal examination to be connected with the uterus by a broad band which is attached at the lower part of the uterine body.

Pregnancy in a rudimentary horn of the uterus usually ruptures from the fourth to the fifth month, somewhat later than is the case with tubal pregnancy. Authorities seem to agree that the same treatment should be applied to both conditions. If rupture has occurred the abdomen should be opened and the uterus removed. If rupture has not occurred and pregnancy is still in the first six months a section should be done and the condition corrected. If the diagnosis is not made until after the sixth month, then, in view of the lessened danger of rupture, the operation may be postponed, provided the patient can be kept under careful observation until the child is viable, when it should be removed by an abdominal incision.

Tradition Versus Embryology in Congenital Malformation *

"And Jacob took green rods of poplar and of almond and of plane trees and peeled them in part; so when the bark was taken off in the parts that were peeled, there appeared whiteness; and the parts that were whole remained green; and by this means the color was divers; and he put them in the troughs, where the water was poured out, that when the flocks should come to drink they might have the rods before their eyes, and in the sight of them might conceive. And it came to pass that in the very heat of coition, the sheep beheld the rods, and brought forth spotted, and of divers colors, and speckled."

Seventeen years ago a baby with three legs was brought to my father, Dr. Hunter McGuire, for examination and advice as to treatment. The mother attributed the deformity to a maternal impression. She stated that one day when she was about eight weeks pregnant she heard strange noises in her kitchen. None of the other members of the family were in the house and although alarmed she determined to investigate the cause of the disturbance. Going to the kitchen she threw open the door and discovered a man having sexual connection with her cook on the floor. She seized a stick and belabored the couple until they fled from the house.

The shock of the incident was very great and for weeks she was nervous and hysterical. When awake she constantly recalled the sight of exposed anatomy and at

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* Read at the meeting of the Medical Society of Virginia, Norfolk, Va., October, 1912.

night her dreams were filled with visions of moving legs. She dreaded the effect on her unborn child and her fears seemed realized in the deformity already mentioned.

On examination the baby was found to be healthy and well developed. He had three legs of equal size and length. The extra limb was attached to the pubis above the penis. Except for a double foot it was symmetrical with the other legs. When the child lay on his back he kicked vigorously with all three legs and sucked the toes of each with perfect impartiality.

The case was exhibited at the clinic of the University College of Medicine and at the time attracted much attention. My father advised the woman to take the boy home and return when he was two or three years old to have the superfluous leg amputated.

Nothing further was heard of the case until last June when the patient walked into my office. He was a stalwart youth, evidently accustomed to outdoor work, and weighed about one hundred and fifty pounds. His general health was excellent but the extra leg, he said was a nuisance and he wanted to get rid of it.

On stripping the boy I found he carried the third leg extended on his abdomen and chest, the limb being kept in place by means of a strap which encircled the body. Owing to long disuse the leg was much emaciated but its length was approximately that of the other limbs. The leg was attached to the patient's body by three bony processes, a median and two lateral. They sprang from the anterior surface of the pubic bones and united in a knob that formed the acetabular cavity.

The head of the femur was perfectly formed. The knee-joint was normal except that it had no patella. The
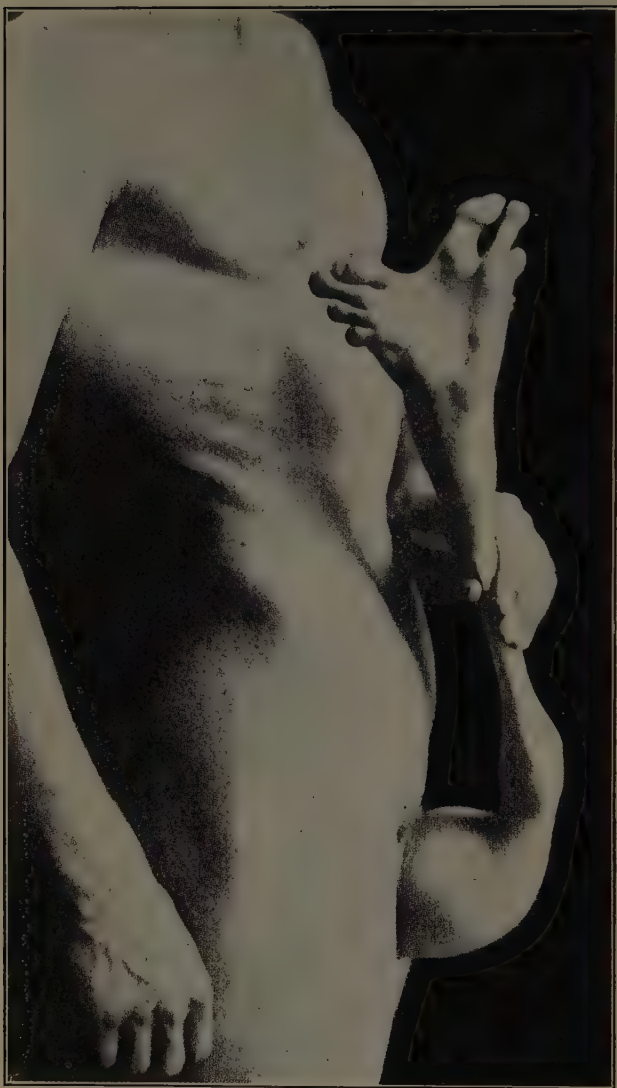
FIG. 1—Photograph of Patient.

foot was deformed and had nine toes. The accompany-
ing photograph and X-ray pictures give a better idea of
the patient's condition than any verbal description.

I operated on the boy at St. Luke's Hospital on June
18, 1912, incising the soft structures and cutting the bony
attachments to the pelvis with a chisel and mallet. The
patient made a rapid and uninterrupted recovery and a
recent letter states that he is now well and doing manual
work on the farm.

The case is reported partly because it is unusual and
interesting, but chiefly because it again raises the much
discussed question of the influence of maternal impres-
sions on fetal development.

Belief in the efficacy of some profound impression upon
the mother to produce upon the body of her unborn child
a direct and definite effect coinciding more or less accur-
ately with the object causing the impression, began ap-
parently with the dawn of history and in certain quarters
exists today with scarcely less prestige than it did a thous-
and years ago.

The biblical incident recording the success of Jacob's
stratagem with the peeled rods reads no more strangely
than the gravely recited case of a great present-day
authority whose pregnant patient, after being seized by
an ear and dragged about the room by her drunken
spouse, gave birth to a child having a triangular piece
lacking from the corresponding lobe of the ear.

In the realm of fiction and philosophy we find Dickens,
Goethe, Scott and others of equal note apparently firm
adherents of the impressionistic idea, and the great mass
of medical testimony of their day decidely of their point
of view. Even at the present time we find cases of sup-

posed maternal impression reported so frequently in our scientific journals that one questions why there is either not a world full of monsters or else a race of rare and radiant beings moulded at will by professional guardians of impressionable mothers. Associated with the belief in maternal impression is a cloud of superstition with reference to the nature and the cause of monstrosities. The purposes of this paper do not permit even mention of the various fanciful theories which attributed the origin of terata to the sport of the gods, to the anger of offended Deity, to cohabitation with Satan, to a malign stellar assemblage, or to one or another of a hundred more causes.

With the discovery of the ovum and the advent of modern embryological research, the theory of maternal impression suffered some decline, but the stubborn recurrence of fresh "proofs" has invariably fanned the flame whenever it seemed in serious danger of flickering out. As we have said these proofs are still accumulating and the result, in our own day, is that while the theory has lost many adherents, particularly in the professional ranks, it is still firmly rooted in the minds of the laity, and indeed yet claims the serious attentions, if not the actual outright belief of many trained medical men. An examination of numerous obstetric texts of recent years reveals a degree of credulity astounding to the modern scientific enquirer. So considerable an authority as Hirst states in his fifth edition that there are "well authenticated cases of congenial defects or peculiarities which bear too startling a resemblance to the cause of the impression upon the mother during pregnancy to be dismissed as mere coincidence." Many more names might
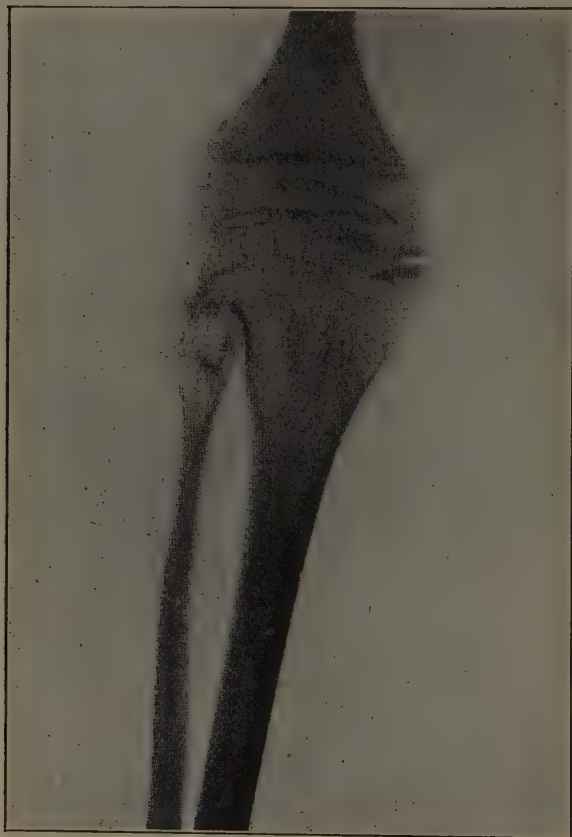
Fig. 2—X-Ray of Knee Joint.

be added to the list and from the rank and file of the profession might easily be collected a legion of those who have observed in private practice enough to win them to the ancient superstition.

These men are as earnest and as thoughtful as we and it is by no means the effort of this paper to cast ridicule upon those who honestly hold to convictions opposed to our own; at the same time the subject is of such practical importance that if we can show the impressionists the error of their way we shall have served many anxious mothers well and gained a step amply repaying the loss of a few broken idols. The pregnant woman already has to endure enough without being constantly harried with the dread that some temperamental excess will stamp her child for life or some accident will cause her to bring into the world a monster upon which man will hate to gaze.

Would it not be a boon to the expectant mother to have it authoritatively stated that she can now dismiss at least this one danger of her pregnancy? Is it not time for us to realize that we are sheltering a superstition and encouraging unnecessary fears, instead of relieving the mental stress of a class of patients often painfully in need of a comforting word?

At the outset it is well enough to admit that as yet the embryological evidence advanced in contradiction of the impressionistic idea is neither clear nor definite, though it is of sufficient weight to warrant the belief that we are actually approaching an understanding of some hitherto baffling problems involving not alone this idea but the whole vexed question of heredity itself. At the same time it cannot be denied that when the negative results of maternal impressions are ignored, as is persistently

done, and the long list of cited cases are considered on their face without regard to whether or not they clash with scientific probability as justified by modern research, the argument might well be convincing to the laity, and even to the members of the profession who by habit or inclination have come to value their eyes and ears more than their microscopes.

A careful study of the cases reported in the past and a close scrutiny of the instances likely to arise in the future will show that in the vast majority the impression which was supposed to have left its mark upon the fetus occurred long after the development of the affected part. Embryologists have proved rather conclusively that the matrix of the new being is laid down during the first five weeks of intrauterine life and that thereafter the process is concerned no longer with the production of new parts but chiefly with the mere growth of those already formed. In other words organogenesis takes place before the mother even knows she is pregnant and impressions occurring thereafter can no longer affect the type, certainly so far as multiplicities are concerned.

When due consideration is given to the negative evidence against the theory, the cases cited in its support seem pitifully few and inadequate. Indeed we have right here what, to most of us is sufficient to dispose of the assumption, for to view on the one side the vast number of unimpressed and on the other the isolated few who bear the stamp gives us ample warrant for the conclusion that the few are the result of chance and not of rule. There is in all the realms of science no natural process that deals only in exceptions, and when we meet such a situation we can safely question and refuse to ac-

Fig. 3—X-Ray of Foot.

cept. Were the impressionistic theory true, as many believe, then would we be wondering and worrying, not over those afflicted as we do now, but over the good fortune of those who escaped.

But though we accept the evidence of the many we must somehow account for the few and therefore what is the "chance" to which we have attributed their existence? The appeal to "coincidence" often cloaks mere ignorance, but we employ the word here deliberately and with full regard for the improper uses to which it has so frequently been put. With the existence on the one hand of a series of possible irregular forms of development and on the other a series of possible impressions upon the pregnant woman, does it seem strange that occasionally the two series should coincide.

There are many deep-rooted superstitions founded upon just this coincidence. No argument however profound can convince the old woman whose "man" gave up the ghost soon after a sparrow perched upon the window ledge and pecked at the pane. *"I seen it"* is her sole, withering and all-satisfying answer, and it must be admitted that to those who judge all things by the evidence of their own eyes and ears the appeal is a powerful one. And yet with window-pecking sparrows surrounding us and death ever lurking near, it appears not unreasonable to believe that once in a while the visitation of the Grim Reaper and the curiosity of the sparrow should coincide.

Before passing from this point it may be remarked also that the pregnant state is peculiarly adapted to unintentional self-deception and that many of the cited cases cannot even claim the dignity of coincidence being merely *ex post facto* explanations suggested by the deformity.

In other words, we can find that the deformity produces the impression in many instances instead of the impression producing the deformity. When a woman discovers in her child some peculiar mark it is easy enough to search through nine months of incidents, impressions, dreams, emotions, fears and what not and find something remotely resembling it.

The discovery of the reduction and division of the chromosomes and the realization of its immense importance as the basis for a satisfactory theory of heredity marked an important advance and as Piersol says "has given to our knowledge of fertilization an almost mathematical precision and supplied an accurate morphological basis for our understanding of heredity." We seem here on the very threshold of that long-sought scientific knowledge of the laws governing the transmission of peculiarities from generation to generation.

As for the aberrant types and the variations which are not transmitted from generation to generation but are peculiar to the individual in question, in other words, those often claimed to have been "impressed" upon the fetus through the mind of the mother, the biologist also has his authoritative word.

It has already been noted that the details of the organism are determined in miniature in the early weeks before the woman even realizes she is pregnant. It should also be stated that during this early period before the placenta has developed, there is no organic connection between the segmenting ovum and the parent. Except that the one rests within the other, the two in the human being during this early period are as distinct as the chicken egg from the hatching hen. This being true, it is difficult

to see how impressions could pass between the two. Later on, after the placental circulation has developed and the child begins to thrive upon the mother, there is indeed a definite connection, but now the embryonal or developmental stage has been passed and the stage of new growth begun. Hence, even were the organic connection complete, impressions could no longer affect the fetus in the sense of producing multiplicities or duplicities, though they might place their stamp upon organs or parts already formed. But the organic connection is by no means complete. There is absolutely no link between the nervous system of the mother and that of her offspring, and since the impressionist evidently assumes that the external cause operates through the mind of the parent, we are at a loss to see how it bridges this gap. While the mother bears her child she merely supplies it with the food necessary for its growth. There is even no admixture of blood, the transmission being affected by osmosis through a definite membrane which may be demonstrated with the microscope. If the hen could speak we would probably learn vastly more of the impressionists' side of the case, since monstrosities are much more common in birds than in mammals, and the process must be much more complex, the egg lying entirely outside the body and the "impression" having, therefore, to travel a long distance through feathers, space and shell. Similarly the incubator, were it not dumb, might throw much light on the problem and entertain us with an account of the impressions which it transmitted to the artificially hatched chickens in which strange deformities are so often found.

And now what can we say of the real cause of these anomalies? "They are the result," says Ballantyne, "of

disorderly embryology, or disturbed ontogenesis and organogenesis; many of them are arrested developments and represent the stage which ought to have been temporary in ontogenesis, but which have remained stationary while other and neighboring parts were pursuing the path of normal development." The marvellous combinations and recombinations by which the three primary blastodermic layers are woven into the human texture certainty offer enough field for an occasional incongruous thread, particularly when it is remembered that the loss of a few cells in the embryonic period may mean the absence of the entire organ into which they would subsequently have developed. Hence it needs no cataclysm to produce "disorderly embryology" and the influence of several definite factors has been more or less definitely proven. The germ plasm itself may be defective. Intrauterine pressure, and even external traumatism, may so disturb the fetus as to affect its development. Malposition of the fetus *in utero*, abnormal diminution of the amniotic space and adhesion of the membrane to the fetal parts may all profoundly affect development, as has been proven by numerous authenticated cases.

Finally, the state of the fetus may be seriously affected by the general condition of the parent. It is conceivable that a profound shock might so severely affect the health of the mother as to impair the decidual circulation and thus harm the child by an insufficient supply of food-laden blood. The disturbance may be so severe as to produce outright abortion or it may be less severe and merely cause defective growth. But this is a very different thing from shocking into existence a new leg or a

frog-like head when both leg and head have already been normally and perfectly developed.

With reference to the case cited at the beginning we, therefore, attach no significance to the mother's explanation, preferring to believe that it is but another instance of "disorderly embryology" in the production of which external impressions had no part.

Treatment of Diffuse Suppurative Peritonitis *

In studying the subject of suppurative peritonitis it soon becomes apparent that the differences in the views of various authors with reference to certain types of the disease are due to a failure to adopt the same classification, and to a lack of a clear conception of what is meant by the terms employed. We read of septic peritonitis, local suppurative peritonitis, general suppurative peritonitis and diffuse suppurative peritonitis.

The term septic peritonitis should be employed to designate those cases in which the pyogenic infection is so acute and virulent that the patient dies before sufficient time has elapsed for pus to form.

The term local suppurative peritonitis should be employed to indicate those cases in which, owing to the character of the infection, pus develops slowly and nature has time to form adhesions which confine the pus to a limited portion of the peritoneal cavity.

The term diffuse suppurative peritonitis should be reserved to designate the conditions in which the infection is less virulent than in septic peritonitis, but more acute than in local suppurative peritonitis; where there is time for pus to form, but not time for nature to wall it in by adhesions, and, as a consequence, pus is free in the peritoneal cavity.

The term general suppurative peritonitis should be discarded. It was originally used in contradistinction to local suppurative peritonitis, and while its meaning should be apparent it has been misconstrued, thus giving cause for much discussion. The term was never intended to mean that the whole peritoneal surface was involved. The word "general" was used to indicate that the pus was free, in contrast with the word "local," where it was confined. To avoid recurrence of unprofitable argument and the statement by some that no patient with general suppurative peritonitis ever recovered, and the reply by others that, as the term was employed, no patient ever lived long enough to develop it, it is to be hoped that the title, general suppurative peritonitis, will be dropped from surgical nomenclature, and diffuse suppurative peritonitis substituted for it.

The confusion alluded to in the classification of peritonitis is responsible for the condition which existed ten years ago, when Abbe, McBurney, Finney and others were reporting numerous successful operations for general suppurative peritonitis, while at the same time, Senn declared that he had opened, drained and washed out the general peritoneal cavity in many cases of septic peritonitis without a single successful result; Weir that he had never been able to save a patient with general suppurative peritonitis, and had never seen one saved; and Granvin that, until recently, he had expected death after general purulent peritonitis and was not at all ashamed of his mortality rate of 100 per cent. At this period, and for some years afterward, the accepted mode of treatment was incision and removal of the focus of in-

FIG. 4—Bed Elevators

fection: evisceration, irrigation and sponging; counter incisions through the loins and the insertion of multiple drains. The result was a mortality of about 80 per cent.

The present generally accepted method of treatment was not adopted empirically, but was the result of deductions from scientific observations. Its essential features consist of Fowler's position and Murphy's proctoclysis: hence, it may properly be called the Fowler-Murphy treatment. In justice to others, however, the following history of the evolution of the method is given:

Muscatello demonstrated that the peritoneum of the upper abdomen, or diaphragmatic region, possesses much greater and more rapid absorptive power than the peritoneum of the lower abdomen or pelvic region. Clark saw the possibilities of postural drainage and advised elevating the foot of the patient's bed, thus throwing fluid, by gravity, to the surface which would most rapidly absorb it. Fowler said that the principle of postural drainage was correct, but its application was wrong; that the fluid should not be drained into the patient, but out of him. He advised elevating the head of the bed to allow the fluid to gravitate from the diaphragm where it would be absorbed, to the pelvis where it would be collected until removed by a drain. Bond demonstrated that particles of indigo-carmine placed inside the anus would be carried upward by what he termed "reverse mucous currents." Cannon showed that except during defecation antiperistalsis is the normal movement in the large intestine, and that, owing to this fact, liquid feces are carried back into the cecum, where the watery element is absorbed.

Murphy suggested utilizing the foregoing observation in the treatment of suppurative peritonitis, by injecting saline solution slowly into the rectum, depending on reverse peristalsis to carry it to the cecum where it would be absorbed. He reasoned that, owing to the patient being unable to take as much water as was being eliminated, he became dehydrated and the empty vessels of the peritoneum rapidly absorbed any fluid the cavity contained. If, by introducing a large quantity of fluid into the circulation, the vessels could be overfilled, then the peritoneum would be changed from an absorbing surface to a secreting surface, and in place of toxic fluids going into the circulation, there would be a flow of cleansing serum into the peritoneal cavity.

The practical steps of the Fowler-Murphy method are as follows: Open the abdomen over the seat of the primary focus of infection and correct the trouble, whatever it may be, so as to prevent the admission of further poison. Make a second short incision immediately above the pubes, and insert a large rubber drain to the bottom of the pelvis. The work should be rapid, with as little manipulation of the viscera as possible, and no effort should be made to remove the pus by sponging or irrigation. Place the patient in bed in an exaggerated Fowler's position. Give saline solution by continuous low-pressure rectal instillation; administer morphine, in small doses, for pain and spartein, in large doses, as a general stimulant and prophylactic against suppression of urine. Purgatives should not be employed, but bowel action secured by the cautious use of enemata. If there is much nausea or vomiting the stomach should be thoroughly irri-
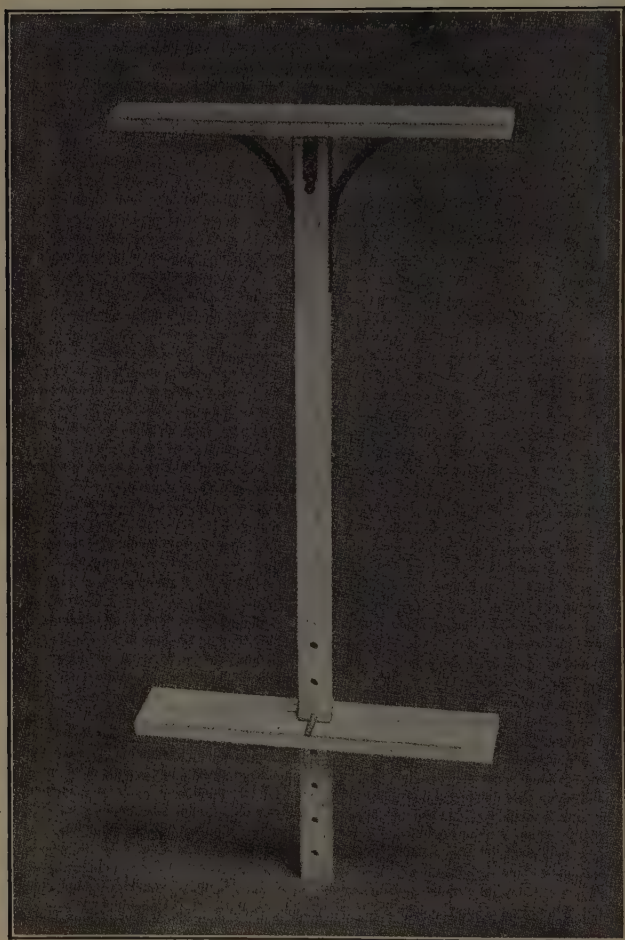
FIG. 5—Bed Seat

gated, and no food should be given until the patient can retain and assimilate it.

By the adoption of the method outlined I have seen a great change in my mortality. A recent analysis of the last 500 cases of appendicitis operated on in my private hospital gives a record of twenty-four patients with diffuse suppurative peritonitis. The first six were treated by the old method of irrigation and multiple drainage, with five deaths. The last eighteen were treated by the Fowler-Murphy method, with but one death.

Coffey has demonstrated that there are three cavities or basins of the peritoneum to be drained—the right and left flank, separated from each other by the spinal column and the pelvis, separated from the flanks by the psoas muscle. When the body is horizontal each flank holds more fluid, and is deeper than the pelvis. The bottom of the flank cavity is four inches below the top of the divide made by the psoas muscle. Hence, theoretically, a patient's body must be elevated to an angle of 50 degrees to permit gravity drainage of the flanks. I have found great difficulty in maintaining a patient in this position, and recently, in visiting various hospitals, I have always inquired what method or apparatus was employed in managing such cases.

I have found two principles in practice, angulation of the patient and angulation of the bed. The first is effected by keeping the bed horizontal and elevating the patient's body by means of a shoulder rest; the second, by elevating the head of the bed and allowing the patient to lie flat on the inclined mattress. As one method must be superior to the other, I have given their relative merits

considerable thought. The advantage claimed for the "semi-sitting position" over "bed-elevation" is that it gives better drainage. This I do not believe is true, because, as I will try to show, it is impossible to maintain a patient in the proper position on a shoulder rest, while it is an easy matter to prevent his slipping on an inclined mattress, no matter what the elevation.

The disadvantages of the semi-sitting position are: (1) It makes it difficult for the nurse to place the bedpan properly; (2) it is unnatural and subjects the patient to mental and muscular tension; (3) he will slip down when relaxed by weakness or sleep, so that his body will bend at the costal arch and his abdomen will be on a plane parallel with the surface of the bed. To prevent the tendency to assume this false position, some surgeons use auxillary straps attached to the shoulder rest; some a double inclined plane to support the legs; and others go so far as to elevate the foot of the bed. None of these methods, however, satisfactorily corrects the trouble.

The advantages of elevating the head of the bed are: (1) The mattress may be put at any angle; (2) the patient lies on a flat surface, often unconscious of his position; and (3) he is completely relaxed and easily nursed. The difficulty experienced in managing this position has been to get a simple device for raising or lowering the head of the bed, and to devise a means to prevent the patient from sliding down the incline. Blocks, boxes and tables have been used for the first, and pillows, hammocks and swings placed beneath the buttocks and attached to the head of the bed, for the second.

Fig. 6—Bed in Moderate Elevation

I herewith present a model and photographs of a simple and cheap apparatus which I have employed for more than a year to accomplish both of the desired ends. The bed elevator (Fig. 1) consists of a wooden base and upright piece. There are a number of notches on the side of the upright, into which fits an iron link which supports a block to receive the leg of the bed. The link when horizontal, slips up or down, but when oblique fits into a notch, just as does the lock of an ordinary needleholder.

The bed seat (Fig. 2) consists of a board which either bare or padded with a pillow, makes a shelf on which the patient sits. A wooden shaft projects downward and passes through a second board which rests against the foot-piece of the bed (Fig. 3). In the shaft are a number of holes, and a peg placed in one of them will prevent the shaft from passing through the bottom board, and thus transfer the weight of the patient to the foot of the bed.

The advantages of the bed seat over a hammock or swing are its rigidity and consequent sense of security given the patient; the ease with which it can be removed and replaced by the nurse when it is found necessary to do so; and also the fact that there are no straps or ropes on either side of the patient's head or body to embarrass the nurse or alarm the relatives. Both of the devices described can be made by any carpenter at the cost of a few dollars, and will securely maintain the patient at any angle for any time without discomfort.

The Surgical Treatment of Dyspepsia *

A generation ago nearly all of our knowledge with reference to diseased conditions was derived from post-mortem examinations made by pathologists. Today much of our information is derived from ante-mortem examinations made by surgeons. Observations taken during the early stages of disease before the initial lesions are obscured by secondary complications and terminal infections have changed many of the theories formerly held by the profession, and in no instance has this been more radical than with reference to the so-called "dyspepsia."

It was formerly taught that indigestion was purely a functional disturbance of the stomach to be treated by hygienic, dietetic and medicinal measures; it is now accepted that indigestion when chronic or recurrent is almost invariably caused by organic changes in the stomach, duodenum, gall-bladder or appendix, and that relief from symptoms can only be permanently secured by surgical correction of the anatomic lesions.

Every one suffers at times from indigestion due to indiscretions in eating, but no one has constant, persistent dyspepsia lasting for months or years unless it be due to some organic disease. A case of indigestion ought not to be subjected to surgery until it has been carefully and properly treated by medical measures, but every case that fails to secure relief in a reasonable time should be exam-

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ined to see if there is not some indications for operative intervention.

In investigating a patient it should be remembered that while the symptoms may be due to disease of the stomach itself they may also be due to reflex irritation from disease of some other abdominal organ. It is a fact that in nine cases out of ten it will be found that the lesion is not in the stomach but in some associated viscus, such as the duodenum, appendix or gall-bladder. In other words, while the symptoms are gastric and the treatment is surgical the operation required is not necessarily on the stomach.

Appendicitis, cholecystitis and duodenal ulcer are supposed to interfere with digestion by causing a spasm of the pylorus. Pylorospasm is a protective effort on the part of nature to prevent the passage of irritating gastric contents into the intestinal tract. The most prominent symptom is a cramping pain in the epigastrium which may last only a few minutes or may continue several hours. In some cases the spasm may relax suddenly, in others it may terminate slowly and gradually. Some patients have attacks several times a day, others at intervals of weeks, and others still only once or twice a year. In the interval between attacks digestion may be normal. During attacks the peristalsis of the stomach is increased, but food cannot pass through the pylorus and often relief comes only after vomiting. Pylorospasm is a symptom, not a disease. It is usually the expression of disease of some remote abdominal structure. To effect a cure the real cause of the condition must be removed, and the patient treated until the hypersensitiveness of the

pyloric muscle is relieved and its spasm habit overcome.

The essential role which surgery plays in the successful treatment of the various forms of so-called chronic dyspepsia will be impressed by a brief review of the symptoms of duodenal ulcer, infection of the bile tract, chronic appendicitis and gastric cancer.

Duodenal Ulcer, while formerly thought to be rare, is now known to be a very common disease. Patients give a history of indigestion of many years standing with intervals of complete relief from symptoms. At first there is the development of a sense of weight, oppression and distension after meals. Later it is noted that discomfort occurs regularly from two to three hours after taking food. Pain comes on gradually, and slowly increases. There is a sensation of fullness followed by eructation of gas or bitter fluid. Symptoms are immediately and completely relieved by taking food, and patients frequently keep a biscuit or glass of milk easily accessible in order to arrest the "hunger pain" when it develops. A characteristic feature of duodenal ulcer is the recurrence of symptoms after intervals of complete relief. Attacks come on as the result of exposure to cold, imprudence in eating, worry, or over work. The physical signs consist in some tenderness in the epigastrium and rigidity of the right rectus muscle. In the later stages when stenosis develops there are the signs of dilated and obstructed stomach. Still later there may be hemorrhage, the blood appearing in either vomitus or feces. Hemorrhage is usually a late symptom. It is an evidence of deep penetration of the walls of the duodenum

by an ulcer whose existence should have been recognized
by other symptoms at an earlier period.

Chronic Cholecystitis, with or without gall stones, is
another common cause of indigestion. Symptoms during
the early stage of the disease are always referred to the
stomach. There is usually gastric distress coming on
shortly after taking food and relieved by eructation of
gas. Frequently there is nausea and vomiting attended
by a dull pain beginning in the epigastric region and ex-
tending around the right side at the level of the tenth rib.
Later there may be typical attacks of biliary colic. The
pain is sudden in its onset and sudden in its relief, and is
attended by a sharp catch in the breath. It is cramp
like, goes through to the back and up to the right shoulder
blade. The pain is not produced nor is it relieved by
taking food. It is attended by nausea, retching and vomit-
ing, and followed by sweating and prostration. Still
later there may come the symptoms of duct obstruction
with jaundice, or duct infection with chronic pancreatitis.
Jaundice is not present in 50 per cent. of cases and its
absence should not prevent a proper diagnosis.

Chronic Appendicitis may exist for years and cause no
symptoms except dyspepsia. The patient has no pain or
tenderness at McBurney's point, but suffers with acid
stomach, eructation of gas and occasional vomiting. The
symptoms come on after eating but there is no regularity
as one meal may cause trouble while another produces no
ill effect. Food never gives relief and exercise usually
makes the symptoms worse. After a longer or shorter
time there comes an acute attack of appendicitis with
symptoms which make the diagnosis evident. An opera-

tion is done to save the patient's ilfe and six months later the individual comes back to say you have restored his health. The removal of the appendix has cured his dyspepsia and he is able to eat what he pleases with impunity.

Cancer of the Stomach usually develops at the seat of and old ulcer. A careful investigation of the patient's symptoms will usually show history of indigestion extending over many years, first characteristic of hyperchlorhydria, then of gastric ulcer and finally of cancer of the stomach. There is first indigestion with sour eructation and pain two to five hours after eating. Later vomiting of bitter acid fluid, constant discomfort or distress and intense pain immediately after eating. Finally obstructive symptoms with vomiting of retained food mixed with blood. There is progressive weakness, emaciation and cachexia. In the last stages there is usually the presence of a palpable tumor.

The foregoing histories cover a host of cases treated by the general practitioner for gastralgia, chronic gastritis, sour stomach or acid dyspepsia. They are definite surgical diseases and should be recognized as such.

Spasmodic obstruction of the pylorus, or pylorospasm, due to reflex irritation from chronic disease of the appendix or gall-bladder should be relieved by removing the cause, not by an operation on the stomach itself.

Organic obstruction of the pylorus from cicatricial contraction of an ulcer of the stomach or duodenum should be relieved by the provision of a new outlet by means of a gastro-enterostomy.

Non-obstructing ulcers and early carcinomas of the stomach should be removed by resection.

I trust the views expressed will not be considered too radical. None of them are original but are a compilation from the writings of men of experience and authority. With increasing knowledge of disease from observations made by surgeons during operations, from investigations conducted by scientists in laboratories, and from deductions made by internists from patients in actual practice, we find our views as to the proper treatment of certain conditions rapidly changing.

Today ex-ophthalmic goitre or hyperthyroidism is considered a surgical affection. I feel sure in time it will be transferred to the department of internal medicine. Until recently dyspepsia has been treated medically. I feel sure the conscientious physician will soon refer all cases which resist a reasonable amount of treatment to the surgeon.

CONCLUSIONS.

1. Persistent or recurring indigestion is not due to errors of secretion but to anatomical lesions of the stomach or associated viscera.

2. A patient who is not relieved in a reasonable time by medical treatment should have the abdomen opened even if the operation is in the nature of an exploration.

3. While the symptoms are gastric in nine cases out of ten the lesion will not be found in the stomach but in an associated viscus such as the duodenum, gall-bladder or appendix.

4. Pylorospasm should not be treated by a gastroen-

terostomy but by an effort to diagnosticate and remove the irritation which produced it.

5. It is advisable at the time of the operation to examine all abdominal organs and correct every abnormality lest the obvious may not be the real cause of the symptoms.

6. It is important that these cases should have proper post-operative and post-hospital treatment.

Analysis of the Last Five Hundred Cases of Appendicitis Operated On at St. Luke's Hospital *

I have no apologies to make for reading a paper on appendicitis, because the disease is so frequent as to necessitate approximately one-third of all the abdominal section done, and because, too, it is so many-sided as to constantly present new features for discussion. I must apologize, however, at the very outset, for the personal character of this paper. It is not a review of the literature of the subject, but a statement of observations and conclusions based upon my own work. At another place and to other audiences, I might be thought to be egotistical, but here among my friends, many of whom have brought me the cases reported, I trust the spirit in which I write will not be misunderstood. As a further extenuating circumstance, I would say that this is the first paper on appendicitis I have ever read before this or any other Society.

Surgically speaking, appendicitis and I are about the same age. I saw my father open a "perityphlitic abscess" in 1886, and was his assistant in the seventeen operations which formed the basis of his original contributions to the literature of the subject. For the past sixteen years I

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* Read at meeting of the Medical Society of Virginia, Chase City, Va., November, 1907.

have operated on a progressively increasing number of cases, but I have avoided the subject in my writings, because my views as to the treatment of certain types of the disease have several times changed, and I have hesitated to put myself on record until, by the careful study of a large number of cases, I could satisfy myself of the correctness of my conclusions.

The five hundred cases of appendicitis which form the text of this article were all operated on at St. Luke's Hospital, and cover a period of about five years' work. The figures given have been tabulated by one of my assistants, Dr. LaRoque, and I wish here to acknowledge my indebtedness to him for his accurate and laborious work. They are not selected cases, but are taken consecutively from the records of the institution, and therefore represent the disease as it occurs in this section of the country.

These cases do not include the removal of 325 normal appendices, which were done in the course of operations for other troubles in the abdomen during the same period of time. There was no death in this list of cases, but it does not seem fair to include them, for while it is true they were operations of appendectomy, the patients were not suffering from appendicitis. Nor does the list embrace cases of appendicitis done during the same period at the Virginia Hospital and other institutions, because, first, of lack of accurate case records, and, second, a desire to cover a considerable working period, so as to contrast the results obtained under the old methods with those of more recent adoption.

In order to facilitate the study of the cases reported,

it is necessary to classify them, and I have divided them, not on a pathological, but on a surgical, basis. I have separated them into four classes, which I always have in mind when I am deciding what to do for a patient suffering with the disease.

1. *Chronic appendicitis,* where the operation is done between attacks, and the diagnosis is based on the history of the patient, tenderness over the appendix, and, perhaps, digestive disturbances.

2. *Acute appendicitis,* where the operation is done early, before inflammation extends to adjacent structures, whether the attack be primary or an exacerbation of symptoms during the course of chronic disease.

3. *Appendicitis with abscess,* or a localized collection of pus in the lower right quadrant of the abdomen. These cases are again subdivided into:

(a) Abscesses which are adherent to the parietal peritoneum and can be opened and evacuated without infecting the general cavity;

(b) Abscesses which are not adherent to the abdominal wall and can only be approached by opening the general peritoneum.

4. *Appenicitis with diffuse peritonitis,* where, owing to the acuteness of the infection or the absence of resistence, there is no wall of lymph or adherent bowel and omentum to confine the pus, but it finds its way into the general peritoneal cavity.

Under this classification, the five hundred cases divide themselves as shown in the following table:

	Number.	Deaths.
1. Chronic appendicitis (interval operation)..	177	0
2. Acute appendicitis (early operation)......	206	1
3. Appendicitis with abscess:		
(a) Adherent to peritoneum beneath incision	23	0
(b) Not adherent to peritoneum beneath incision	70	7
4. Appendicitis with diffuse peritonitis.......	24	6
Totals............................	500	14

Race.—St. Luke's Hospital does not receive colored patients, and no record of the nationality of the white patients was kept; hence on this subject the statistics are valueless. It is a fact that appenicitis is not common among the negroes; still, during the same working period, I am sure I have operated on more than fifty cases in this race at another hospital.

Age.—The oldest patient in the series reported was seventy-two, and the youngest, six years old. A casual inspection of the figures giving the ages of all the patients shows that appendicitis is not common at either of the extremes of life. It is comparatively rare in infants and young children on account of the funnel-shape structure of the appendix and cæcum, and relatively uncommon in old age because the lymphoid structure in the appendix atrophies just as it does in the tonsils. The mortality of the disease in the young is high, due probably to to their small omentum and intolerance to infection. In the above cases there are thirty-eight occurring in children—twenty attended by perforation, of which four died. Thus, of the fourteen deaths in five hundred cases, four occurred in thirty-eight operations on children.

Sex.—Of the five hundred cases, two hundred and eight were males and two hundred and ninety-two females. This would seem to show that women, despite the additional blood supply to the appendix through the appendiculo-ovarian ligament of Clado, have no relative immunity to the disease, as compared to men, but, on the contrary, are more predisposed to the disease, probably from the fact of the relation of the appendix to the right tube and ovary, and its liability to infection from that source. An analysis of the figures shows, however, that appendicitis is more apt to assume a fatal form in men than in women, for, despite the greater number of cases occurring in women, there were only five deaths, whereas, in the smaller number of cases occurring in men, there were nine deaths. The fact that appendicitis is more fatal in one sex than the other is believed to be due not only to the additional blood supply of the appendix in the female, to which attention has been already called, but also to the fact that through hereditary immuntiy they have greater resistance to peritoneal infection of the lower abdomen.

Mortality.—In the 500 operations reported there have occurred fourteen deaths. This gives a mortality of 2.8 per cent. Of the deaths, five occurred in the first hundred; five in the second hundred; two in the third hundred; one in the fourth hundred, and one in the fifth hundred. If it were my purpose in this paper to show a low mortality, I would have only reported the last two hundred consecutive cases, and claimed a death rate of one per cent. I have purposely gone back in my records and included cases operated upon as much as five years

ago, in order to show the improvement which has fol-
lowed the adoption of more recent methods of operating.
A surgeon should not try to be a record maker, but a life
saver, and his ability should not be reckoned by the cases
he loses, but the cases he saves. The five hundred cases
reported are not selected, but are taken consecutively from
the hospital records. During the working period covered,
every case admitted was operated on except one, who
was moribund when first seen and died two hours later.
The rapidly decreasing mortality in the series of cases
will be partly explained when I describe the change
adopted in the technique of operating on certain types,
but also has explanation in the education of the pro-
fession and public as to the advisability of early opera-
tion, and the greater promptness with which a case is
now brought to the surgeon. It is an unquestioned fact
that the results obtained in operating for appendicitis
depend not as much upon the skill of the operator as the
conditions and the complications with which he has to
deal.

Symptoms and Diagnosis.—On this subject I have
little to say. When the clinical history and symptoms
are typical, there is no difficulty in making a positive
diagnosis. When the classical signs are absent, it is often
impossible to say that appendicitis does not exist. In
other words, in these five hundred cases, I have never
failed to find the appendix inflamed when I have made
a preliminary diagnosis of appendicitis, and I have often
found it to exist when I had not made a postive diagnosis,
but did an exploratory operation, like Elbert Hubbard
sends a new book—"on suspicion."

Treatment.—It is now a generally conceded fact that there is but one treatment for appendicitis—namely, the surgical removal of the diseased organ. The question that has perplexed the profession is *when to operate.* For a long time I held the opinion that no fixed rule could be formulated and that every case should be decided on its own merit. I then became a follower of Ochsner, and claimed that some cases came to the surgeon too late for an early operation, and too early for a late operation, and that an effort should be made to carry them over this period by gastric lavage, prohibition of food by the mouth, and nourishment by the rectum. Finally, however, after much thought and careful observation, I have become firmly convinced that Murphy was right in his bold and dogmatic statement made many years ago, that we should operate on all cases of appendicitis as soon as the diagnosis is made. There are, of course, a few cases where this rule will work hardship, but I am sure that if it is rigidly applied, it will accomplish "the greatest good to the greatest number," and that the man who follows it will, in the end, save more patients than the one who does not. The objections made to it are that we should not operate upon the convalescent or the moribund. The answer is that it is impossible to differentiate between them and the others. Patients apparently improving and on the road to recovery sometimes develop a fatal complication, and patients apparently dying sometimes get well by means of a timely operation performed by a courageous surgeon.

The question with me is no longer when to operate. It is settled, and I am as free from doubts and misgivings and as happy in the conviction of the truth of my doc-

trine as an erring darky who has been long seeking and suddenly found religion. The question now with me is *how to operate,* and I think this can only be determined by dividing cases into certain groups and applying a different method to each.

1. *Chronic appendicitis, where the operation is done between attacks,* the patient being well, and the diagnosis based on previous history, tenderness over the appendix, and perhaps digestive disturbances. The technique of an operation on this type of appendicitis is not of much moment. Personally, I use McBurney's muscle splitting incision, deliver the cæcum into the wound, and ligate and divide the mesentery of the appendix. I then crush the base of the appendix, tie it with catgut, amputate and bury the stump with a purse-string suture of linen. I then close the peritoneum and the two muscular layers of the abdominal wall with catgut, and sew the skin and underlying fat with horse-hair. If no complications exist, the time of the operation is from five to seven minutes; the length of the incision from two to three inches; confinement in bed, ten to fourteen days; and detention from business, two to three weeks. I have never had a hernia or death following an operation of this type. It is one of the safest and most satisfactory in surgery, not only removing danger of a subsequent attack of appendicitis, but frequently relieving long-standing digestive disturbances and causing marked improvement in the patient's general health.

2. *Acute appendicitis, where the operation is done before inflammation extends to adjacent structures.*—The technique in this class of cases is exactly the same as the foregoing. It is necessary to work more slowly and

handle the appendix more carefully, in order to avoid rupture of its walls and infection of the peritoneal cavity. There is no necessity for the use of drainage, and recovery is as prompt as in chronic cases. The only death I have had in the two hundred and six cases of the present series was due to an error. The patient was a young man just recovering from an attack of appendicitis which had confined him to bed for two weeks. He had stricture of the urethra, for which an operation had been done by another surgeon. Before taking the anæsthetic, he asked that while on the table the stricture be well dilated. The appendix was found congested and adherent, but was removed without difficulty. After the abdominal dressings were applied, a large sound was introduced into the urethra. He did well for some hours, then had a hard chill, developed septicemia, and died within forty-eight hours. As stated, the appendectomy in this case was an uncomplicated one; and four other abdominal sections done the same day, with the same instruments and the same assistants, made uneventful recoveries. I sincerely believe the man's death was due to the urethral instrumentation, but as the primary operation was for appendicitis, the result is classed under that head.

3. *Appendicitis with abcess.*—The technique of operations for this type depends entirely upon whether the abcess is adherent to the abdominal wall and can be incised and drained without opening the peritoneal cavity, or whether it is not adherent and can only be reached by opening the general peritoneum.

(a) If the abcess is adherent to the parietal peritoneum beneath the incision, it should simply be opened

and drained, and no effort made to locate or remove the diseased appendix. With all due deference to those who do not agree with me, I consider it a surgical crime to break up the protecting wall formed by nature, and to liberate infectious fluid into the peritoneal cavity, when a safe exit may be given the pus by simply following the indication of nature and making an incision at the point she is endeavoring to effect drainage. The only danger in adopting this method is that there may be a secondary abcess which will not be drained. This complication should always be borne in mind, especially when the patient has been sick many days. If a second collection of pus is detected, the case should be treated as will be described in the next class.

The safety of the operation advocated is shown by the fact that of the twenty-three cases above reported there were no deaths. In all these cases the patients were told that they were operated on not for appendicitis, but for an abcess which was the result of appendicitis, and that their appendix had not been removed. They were advised of the possibility of future trouble and warned to apply promptly for surgical relief if in the future they suffered abdominal pain. As far as I know, there has been no subsequent trouble in any of the twenty-three cases.

(b) If the abcess is not adherent to the peritoneum beneath the incision, but is between the walls of the intestines or folds of the omentum, in a position in which it can only be reached after opening the general peritoneal cavity, then an entirely different technique must be pursued. After the abdomen is opened and the inflammatory mass located by palpation it should be carefully and

effectually isolated from adjacent structures by numerous pads of gauze wrung out of hot saline solution. Adhesions should then be separated, until the pus collection is opened. It should be sponged out and the appendix sought for and removed. The infected area should then be drained with strips of gauze enclosed in a protecting layer of rubber tissue. One end of the drain should cover the denuded surface in the peritoneal cavity; the other should project through the upper angle of the abdominal incision. In addition to this, a rubber tube should be inserted through the lower angle of the incision so as to drain the bottom of the pelvis, and the patient should be put to bed in an exaggerated Fowler's position.

In the five hundred cases recorded, seventy were of this type, giving seven deaths, or a mortality of 10 per cent. Most of the fatal cases occured before the use of the pelvic drainage and Fowler's position, and in future it is believed results will be much better.

4. *Appendicitis with diffuse peritonitis,* or cases where there is perforation of the appendix and free pus in the general peritoneal cavity. This type, until recently, has been the terror of the surgeon. The old method of opening the abdomen, removing the appendix, washing out the peritoneal cavity with or without evisceration, and making counter incisions for multiple drainage, was followed by a mortality of about 80 per cent. There has been, to my mind, no recent advance in surgery so brilliant in theory or so practical in results as the new technique of treating diffuse suppurative peritonitis. In these cases a short incision should be made over the appendix, and the diseased organ removed, if it is readily accessible. A second incision, not necessarily more than an inch in

length, should be made in the mid-line, above the pubes. A rubber tube one-half inch in diameter, with openings on the side, should be introduced through the suprapubic opening and carried to the bottom of the pelvis. No irrigation of the abdomen should be practiced, no effort even made to sponge out the pus, but a voluminous dressing should be applied and the patient quickly put to bed in an exaggerated Fowler's position. Saline solution should be slowly and continuously given by rectum, the stomach contents washed out if vomiting is persistent, and the heart and kidneys stimulated by the hypodermic use of sulphate of spartine in large doses.

The difficulty often experienced is to keep the patient in the proper position in bed, so that fluids in the abdominal cavity will be carried by gravity to the pelvis. To obviate this, I have devised a bed-seat, which is easily and cheaply constructed and which will maintain a patient, with perfect comfort, at any angle it is desired to elevate the head of the bed. (See figs. 1, 2, 3.)

Of the twenty-four cases of appendicitis with diffuse peritonitis in the cases reported, there were six deaths. Five of these occurred in the first six cases operated on, when the method of irrigation and multiple drainage was practiced. Since the adoption of the new method, two years ago, I have had but one death in the remaining eighteen cases. In other words, the change of technique has reduced the mortality from over 80 per cent. to 5.5 per cent.

Some Accepted Facts and Mooted Points in the Management of Appendicitis *

Before certain societies it is both proper and desirable that unusual cases should be reported, original operations described, and new theories advanced, but at a meeting such as this, I think the time at our disposal should be devoted to the discussion of the diseases we are most frequently called upon to treat; and hence those we should endeavor to know most about. I believe we should recognize the fact that we are practitioners, and not scientific investigators, and that we should leave the solution of new and complicated problems to the men working in laboratories and large metropolitan hospitals, and be satisfied ourselves if we adopt the best and most accepted methods, and apply them skillfully and efficiently for the relief of our patients.

Personally, entertaining these views, I am glad to learn from the program that practically the entire time of this meeting will be devoted to the consideration of appendicitis and typhoid fever. Those who read papers may have nothing essentially new to present, but the same may be said of ministers, who have preached the Gospel for many centuries, and whose labor is not in vain.

History.—Appendicitis was first clearly recognized and accurately described by Fitz, of Boston, in 1886, and the

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* Read at meeting of the Florida State Medical Association, Pensacola, Fla., April, 1909.

profession of America has been largely instrumental in working out the various problems with reference to its diagnosis and treatment. The English and Continental surgeons, for a time, derisively called it the American disease, and were obstructionists in the advance of knowledge concerning it, and although they have now fallen in line, they have never been able to keep pace with the work of the profession in this country.

Frequency.—The frequency of appendicitis is shown by the fact that, according to Osler, it causes the death of one out of every fifty who die, and by hospital records which show that, in recent years, it is responsible for from one-fourth to one-third of all the operations performed. The disease, however, is not as frequent as one might infer from the society notes in a daily paper as, from personal observation, I have known many patients to attribute confinement in a sanitarium to appendicitis, when their disease was in reality a less interesting and fashionable ailment. The laity are under the impression that the number of cases of appendicitis is increasing, but this, of course, is not so. Cases are now correctly diagnosticated as appendicitis, whereas, before they were called gastritis, peritonitis, and inflammation of the bowels. Robert Morris said that if a torch were applied to the tomb of every man dying of unrecognized appendicitis, the world would be a bon-fire.

Why the disease was not recognized earlier.—It seems d'fficult for us to-day, to understand how a disease which was so frequent could have escaped recognition by clinicians of the past, who were justly noted for their accuracy of observation. The explanation lies in the fact the symptoms of appendicitis, originating in an organ

without function, were characterized by reflex disturb-
ances of the function of other and more important organs,
and hence were misconstrued during the life of the
patient. If death ensued and a post-mortem was made,
the secondary complications so obscured the original
lesion that it was overlooked. A physician told me that
while in New York taking a post-graduate course, in
1878, he saw a case in the ward of one of the hospitals
which was treated first for gastritis, then for peritonitis,
and finally for locked bowel. When the patient died, a
post-mortem was made, and the pathologist commented
on the fact that the inflammation had been so severe that
the appendix had sloughed off. Two years later, when
engaged in private practice, this physician saw another
case die with similar symptoms, and before making the
post-mortem, he told his colleagues that he was certain
that they would find the appendix gangrenous, and such
proved to be the case. In neither instance did it occur
to any of the physicians that the condition of the appendix
was the primary cause of the trouble.

Living versus Dead Pathology.—Post-mortem exami-
nations have, of course, been of inestimable service in
increasing our knowledge of disease, but conclusions
based on them have often been erroneous, because they
are made at a period when secondary complications and
terminal infections obscure the initial lesion. The patho-
logic picture of the early stages of disease as disclosed
during life, on the operating table, are immeasurably
more valuable than the findings after death, at autopsy.
This fact is apparently not appreciated by the physician,
or if it is, he fails to take advantage of it. Many will
drive ten miles to see a post-mortem, who would not

go around the corner to witness an ante-mortem demonstration of the same disease at a more instructive stage of its development. In visiting the various surgical clinics of this and other countries, I have often deplored the fact that they were not attended more largely by medical men. Last summer I made a trip to see work in Chicago, Rochester, Cleveland, Boston and New York. In each city I found a number of surgeons. Some were young and some were old; some were rich and some were poor; some were famous and some were unknown. All were possessed by a desire to learn. I do not recall meeting a single physician. They must have been either at home pursuing their usual occupation, or at the seashore, in the mountains, or abroad, taking a vacation. It is sometimes said that the professional and pecuniary rewards of the surgeon are greater than those of the physician. If this be so, where lies the credit or the blame of the reversal of conditions previously existing?

Operate in Every Case.—The one generally accepted fact in the treatment of appendicitis is that every case should be operated on. There is a wide difference of opinion, however, as to when the operation should be done, how the various steps should be performed, and the way the case should subsequently be treated. It is admitted that many cases recover from acute attacks under medical treatment: hence it is obvious that if all cases are operated on, some cases will be subjected to unnecessary surgery. Statistics show that in a hundred cases, eighty will recover without the use of the knife, but they also show that twenty will die. Of these eighty who recover, many will have recurrent attacks, and most of them will suffer from digestive disturbances which

cripple their usefulness. As it is impossible to say from the history, clinical symptoms or laboratory findings which cases need an operation, and which do not, it is, therefore, better to operate on some who do not require it, than to fail to operate on those who urgently need it, especially as the operation in itself has practically no mortality. I say this advisedly, for I do not believe an appendectomy entails any more danger than a trip on the railway. There are, of course, the danger of the anesthetic and the risk of infection, but these, in skilled hands, are accidents no more likely to occur than catastrophes on well regulated railroads. Frequently you see in the daily papers, and sometimes in medical journals, the statement that a patient has died on account of an operation. Usually the fact is that he died from a disease which the operation failed to arrest, and frequently because a surgeon was called in as a last resort to save life, and not as an early effort to restore health. Let the profession differ on other points, but let it unite in teaching the laity that appendicitis is a surgical disease, that every case requires an operation, and that, barring accidents, which occasionally happen in well regulated hospitals as well as in well regulated families, there is no danger in surgical intervention.

Appendicitis now a Question of Economics.—Years ago, when many cases of appendicitis died because operations were postponed until the patient's condition was hopeless, the great question with both the profession and the laity was the mortality. Later, when results were improved, but when operations were still delayed until complications developed, and patients were left with crippling sequelæ, the question was morbidity. To-day,

when practically all cases recover, and are completely restored to health, the question is economy.

A patient, when informed that he has appendicitis, no longer asks what is the danger to his life, rarely discusses the possibility of hernia or other complications, but wants to know how much the operation will cost him in time and money. The question of the length of his stay in the hospital depends largely upon whether it is found necessary to employ drainage. The question of the amount of the surgeon's charge depends chiefly on the patient's ability to pay. It is a fact that there is no case on record where an operator has declined to do the work without a fee if the patient was poor, or where he has failed to require a munificent sum if the patient was rich. The laity should be impressed with the fact that a surgical fee covers three separate factors: First, the satisfaction of having an operator of reputation; second, the security of having one with skill and ability; and third, the physical relief from the actual mechanical work.

When to Operate.—The question of when to operate for appendicitis will perhaps never be satisfactorily settled. Personally, I am convinced that Murphy was right in his bold and dogmatic statement made many years ago, that we should operate on all cases of appendicitis as soon as the diagnosis is made. There are, of course, a few cases where this rule will work hardship, but I am sure that if it is rigidly followed, it will accomplish the greatest good to the greatest number, and that the surgeon who follows it will, in the end, save more patients than the one who does not. The objections made to it are that we should not operate upon the convalescent or the moribund. The answer is that it is sometimes im-

possible to diagnosticate these cases. Patients apparently improving and on the road to recovery sometimes develop a fatal complication, and patients apparently dying sometimes get well by means of a timely operation performed by a courageous surgeon.

Ochsner, by his teaching, has, in my opinion, caused the death of more patients with appendicitis than his personal ability as an operator has enabled him to save, and this not because his teaching was wrong, but because it has been misunderstood, and his treatment misapplied. Ochsner believes in operating on all cases of appendicitis, but in a certain class he advises waiting, employing gastric lavage, rectal alimentation, and Fowler's position, until the inflammation becomes localized, and the patient in a more favorable condition for surgical intervention. Personally, I believe that Ochsner's treatment will save some cases which would otherwise be lost, but despite this fact, I am satisfied that it would be better for the profession and for the public if his teaching had never been disseminated. It has been seized upon by the general practitioner as a medical cure for appendicitis, and has been the excuse for procrastinations which has resulted in many an untimely death.

How to Operate.—An extremely important factor in the success of a surgeon in operating for appendicitis is his ability to differentiate in cases, and to recognize the fact that different groups must be treated in an entirely different way. For practical purposes, cases may be divided into three classes: First, those in which the inflammation is confined to the appendix; second, those in which the inflammation has extended beyond the appendix and resulted in a localized abcess; and third, those in

which the inflammation has caused diffuse peritonitis, with the presence of free fluid in the abdominal cavity.

I. *Chronic and Acute Appendicitis.*—In chronic appendicitis where the operation is done between the attacks, or in acute appendicitis where the operation is done before inflammation extends to adjacent structures, the technique of the operation is not of much moment. The differences of opinion which exist among surgeons are with reference to the location of the incision, the treatment of the stump of the appendix, and the length of time it is necessary to confine the patient to bed.

1. The incisions in most common use are a vertical incision through the right rectus, or an oblique incision, with separation of the fibres of the external and internal oblique muscles at right angles one to the other. Either method gives good results, although, personally, the gridiron incision appeals to me as the one inflicting less traumatism, giving most direct access to the field of operation, and guaranteeing the greatest assurance against hernia.

2. The methods of dealing with the stump of the appendix are endless. The two in most frequent use are simple ligation, and ligation with inversion of the stump by means of a purse-string ligature. I usually practice the latter, as I have never experienced the complications believed by some to be theoretically possible from burying infected tissue, and I think the purse-string suture lessens the possibility of the primary ligature being blown off by gas pressure, and removes the probability of adhesions which otherwise might form on a denuded surface.

3. The question of the length of time it is necessary

to keep the patient in bed after a simple appendectomy is one of great importance. The tendency is to make the patient's stay in the hospital shorter and shorter. This is partly due to motives of economy, but is also influenced by a desire to advertise the surgeon. Between too great conservatism on the one hand, with the attendant loss of time and money, and too great radicalism on the other, with the danger of hernia and other complications, there must eventually be derived a happy mean. For my own satisfaction, some time ago, I sent a circular letter to fifty prominent surgeons, asking the practice of each. The answers varied so widely as to be practically worthless, one stating that he had patients walking about the following day, and another that he kept them in bed forty-two days. My own custom is to keep patients recumbent ten days, allow them to go about in a wheel chair two days, and to discharge them at the end of fourteen days. I heartily deprecate the tendency to competition which exists between some surgeons as to who can get their cases out quickest. The laity and profession ought to be made to understand that, under given circumstances, a wound will not heal quicker for one operator than for another, and the length of time it is thought necessary to keep the patient in bed is not a measure of surgical dexterity, but of surgical judgment.

II. *Appendicitis with Abcess.*—The technique for operations of this type depends entirely upon whether the abcess is adherent to the abdominal wall, and can be incised and drained without opening the general peritoneal cavity, or whether it is not adherent and can only be reached after opening the general peritoneum. If the abcess is adherent to the parietal peritoneum, it should

simply be opened and drained, and no effort made to locate or remove the diseased appendix. With all due deference to those who do not agree with me, I consider it a surgical crime to break up the protecting wall and to liberate infectious fluid into the peritoneal cavity, when a safe exit can be given the pus by simply following the indications of nature, and making an incision at the point where she is endeavoring to effect drainage.

If the abcess is not adherent to the peritoneum beneath the incision, but is located between the folds of the omentum or behind the cæcum, in a position in which it can be reached only by opening the general peritoneal cavity, then an entirely different technique must be pursued. After the abdomen is opened and the inflammatory mass located by palpation, it should be carefully and effectually isolated from adjacent structures by numerous pads of gauze wrung out of hot saline solution. Adhesions should then be separated until the pus collection is opened. The abcess should be gently sponged out, and the appendix sought for and removed. The infected area should be drained with strips of gauze enclosed in a protecting layer of rubber tissue, and a tube should be inserted through the lower angle of the wound to the bottom of the pelvis, and the patient put to bed in an exaggerated Fowler's position.

When an abcess is drained and the appendix not removed, the patient should be told that the operation was not for appendicitis, but for an abcess which was the result of appendicitis. He should be made to understand, that the appendix was not removed, advised of the possibility of future trouble, and warned to apply promptly for surgical relief if he suffered abdominal pain.

I have recently had correspondence with a number of prominent surgeons to ascertain their views as to the necessity for a second operation for the removal of the appendix left in the abdomen at a first operation. I have secured a large number of opinions, and find that while all agree that the organ should be removed if it causes symptoms, they are about equally divided as to the wisdom of operating on every case as a routine method. As an example of the divergent views, I will cite Dr. J. M. T. Finney, of Baltimore, who writes that in all cases of abcess treated by simple incision and drainage, he earnestly advises a secondary operation for the removal of the appendix. He was forced to this opinion by seeing three cases of death during secondary attacks of appendicitis after an appendiceal abcess had been drained and the appendix left in.

On the other hand, Dr. Roswell Park, of Buffalo, writes that he hardly ever advises a secondary operation to remove an appendix which was not hunted up and removed when an abcess was drained, unless it seems to be producing occasional or persistent, even though mild, symptoms or discomfort, *i. e.,* so long as it remains innocent and inoffensive, he does not feel like disturbing it, but when it growls, he would urge its removal.

I have also written to twenty-three patients for whom I had opened and drained abcesses without making an attempt to remove the appendix. I found that all these cases were in good health, that none of them had been operated on a second time, that only two had had recurrence of abdominal symptoms, and therefore, I am disposed to agree with the opinion of Dr. Park, that a second operation should not be done as a routine measure,

but only when called for by symptoms indicative of trouble.

III. *Appendicitis with Diffuse Peritonitis.*—Cases in which there is perforation of the appendix and free fluid in the general peritoneal cavity have, until recently, been the terror of the surgeon. The old method of opening the abdomen, removing the appendix, washing out the peritoneal cavity, and making counter incisions for multiple drainage, was followed by a mortality of about eighty per cent. There has been, to my mind, no recent advance in surgery so brilliant in theory and so practical in results as the new technique of treating diffuse suppurative peritonitis. A short incision is made over the appendix, and the diseased organ removed if it is readily accessible. A second incision, not necessarily more than an inch in length, is made in the mid-line over the pubes. A rubber tube one-half inch in diameter, with openings on the side, is introduced through the supra-pubic opening and carried to the bottom of the pelvis. No irrigation of the abdomen should be practiced, no effort even made to sponge out the pus, but a voluminous dressing applied, and the patient quickly put to bed in an exaggerated Fowler's position. Saline solution should be slowly and continuously given by rectum; the stomach irrigated if vomiting is persistent; and the heart and kidneys stimulated by the hypodermic use of sulphate of spartine. Since the adoption of this method the mortality in this class of cases has been reduced to about five per cent.

Appendicostomy *

The operation of appendicostomy, though less than four years old, has been firmly established as a rational surgical procedure. It consists in bringing the appendix through an abdominal incision, opening its tip and using its lumen through which to irrigate the large intestine. The value of the operation will be appreciated after a consideration of the following facts:

1. Chronic diseases of the large bowel are frequent.

2. They are exceedingly rebellious to internal or local treatment, as drugs by mouth are rendered inert in the small intestines, and injections by rectum are not only disagreeable, but often inefficient because of the difficulty in reaching the upper portion of the tract.

3. The appendix is located at the very origin of the large bowel; hence fluids introduced through it reach every part of the canal.

4. The operation of delivering, attaching and opening the appendix is so simple that it can be safely done by the average surgeon.

5. When an opening is once formed the irrigation can be efficiently carried out by the patient without pain or discomfort.

Experience has proved that the mechanical cleansing which is accomplished, plus the therapeutic effect of the antiseptic or astringent solutions employed, usually brings

* Read at the meeting of the Medical Society of Virginia, October, 1906.

quick relief to patients who have suffered many things of many doctors without benefit.

Appendicostomy, like many other surgical procedures, was first devised extemporaneously during the course of another operation. In 1902, Dr. Robert F. Wier opened an abdomen to do a valvular cecostomy in order to make a fistula through which he could irrigate a colon, the seat of chronic amebic dysentery. He saw the appendix rise prominently into the wound and at once appreciated the advantages of using the calibre of this organ for his purpose. He stitched the tip of the appendix in the abdominal wound and closed the latter around it. When about to apply the dressings, the thought occurred to him that the appendix might not be patulous and he therefore amputated its tip and introduced a No. 12 soft rubber catheter through its lumen into the cecum. The latter was drawn into the wound, anchored and a ligature thrown around the stump of the appendix to prevent leakage. The ligature was removed in twenty-four hours and two days later irrigations of the colon were begun. The result was eminently satisfactory.

The simplicity of the operation, its freedom from danger and the ease and certainty of the ultimate closure of the fistula appealed at once to the profession, and appendicostomy has been adopted as an acceptable substitute for cecostomy in all but a few selected cases.

The original technique has been so improved upon by various surgeons, chiefly Meyer, Dawbarn and Tuttle, that now a most acceptable method has been evolved.

INDICATIONS.

In general, the operation may be said to be indicated in all cases of chronic, non-malignant diseases of the colon,

which do not yield to medical treatment. It has been chiefly employed in chronic amebic dysentery, muco-membranous colitis and syphilitic and tuberculous ulcerations of the colon.

Maunsell has employed it successfully to anchor the cecum in a case of volvulus, and in another to prevent gaseous distention after resection of the small intestine. He also recommends it as a means of relieving tympanites due to intestinal paresis from peritonitis.

Keitley has employed appendicostomy as a substitute for cecal colostomy in a case of carcinoma of the tranverse colon; in a case of intussusception of the ileum into the ascending colon, and also in a case of obstinate constipation. He recommends it to facilitate the introduction of food when feeding by way of the bowel is necessary; and as a means of local treatment of the ulceration of typhoid as suggested by Ewart.

Sir W. H. Bennett suggests the possibilities of the operation as, first, a means of treating diseases of the large and small intestines; second, a means of relieving or preventing intestinal distention; third, a means of artificial feeding; fourth, a substitute for cecal colostomy.

Technique.

The patient is prepared as for the "interval operation" of appendectomy. The abdomen is opened by the gridiron method through an incision large enough to admit two fingers. The appendix is grasped and brought up into the wound, the artery of its mesentery tied and the organ freed to its base. The cecum is then fastened to the parietal peritoneum at the lower angle of the wound by sutures on either side and above the appendix, the

last suture being continued to close the peritoneum. The lesser appendiceal artery should not be included in the side sutures. The abdominal incision is then closed in layers by sutures of catgut, the appendix itself being fastened in the lower angle of the skin wound by a suture on either side. The protruding appendix is then wrapped with thin rubber or gutta percha tissue and the dressings applied. At the end of two days, the dressings are removed. The appendix is usually found gangrenous at its tip. It is amputated about one-quarter to three-eighths of an inch from the skin and its lumen carefully dilated. A catheter should then be introduced and secured by a ligature tied firmly around the stump of the appendix. The ligature serves the double purpose of preventing leakage around the catheter, and at the same time by constriction cuts off the stump of the appendix flush with the skin. The catheter should be introduced about two to four inches. If there is abdominal distention, its lumen should be left open to allow escape of flatus. In the absence of distention, the catheter should be bent on itself and fastened with a safety pin to prevent leakage into the dressings. On the third or fourth day irrigation may be begun.

The question may arise whether it is advisable to attempt appendicostomy in the presence of a small atrophied appendix even though it be patulous. Will its calibre admit a catheter large enough to serve the purposes of irrigation? Tuttle presents two cases in which the organ was found easily dilatable and the results in these cases were more satisfactory than in those with very large appendices. This opinion is confirmed by C. B. Kietley, who, in a case of carcinoma of the transverse colon with

slender atrophied appendix, was able to dilate the latter until he could introduce a small sized rectal tube, the opening afterwards serving as an artificial anus. In my own case herewith reported, no difficulty was encountered in dilating an appendix greatly atrophied and adherent as a result of previous inflammation.

TIME FOR OPENING THE APPENDIX

If there is any doubt of the patency of the appendix it should be opened before the bowel is fixed to the parietal peritoneum in order that if its canal is obliterated the operator may abandon appendicostomy and proceed at once to a cecostomy. The surgeon, by rolling the appendix between his fingers, can usually determine whether the organ is patulous. If it is permeable, he should not take the risk of infecting the wound by opening the canal until two or three days after the operation. This is strongly insisted upon by Tuttle. Every case of post-operative hernia noted by this observer has followed the cases in which the appendix was opened at the time of operation, and in all cases there has been subsequent if not consequent infection. Of course such a practice is not advisable in cases in which the operation is done for intestinal obstruction or paralysis, for artificial feeding, or any very acute conditions. In such cases, just as in colostomy, a few hours delay is all that is necessary. When opened early the appendix should be cut off fully half an inch from the skin, a catheter introduced and a thread tied around the stump to avoid leakage.

SOLUTIONS FOR IRRIGATION.

The selection of a fluid for irrigation will depend upon the diseased condition. In amebic dysentery the consen-

sus of opinion is largely in favor of quinine solutions. Tuttle recommends normal saline solution at a temperature of 65 to 75 degrees F., and advises that care be exercised to use normal salt solution and not brine.

In catarrhal colitis, with or without ulcerations, solutions of nitrate of silver 1-5000, argyrol 5 per cent. to 25 per cent., peroxide of hydrogen 10 per cent. to 20 per cent., and aqueous fluid extract of krameria 10 per cent., have all been used with more or less satisfaction. Some of these cases yield very promptly and others are very obstinate. Ewart reports a case in which appendicostomy was performed for colitis with diarrhea and profuse bloody discharges. The hemorrhages continued in spite of all the ordinary irrigations, but finally ceased after injecting liquid paraffin into the colon.

When and How to Close the Opening.

The time at which the appendiscostomy fistula should be closed depends upon the disease for which the operation has been performed, the history, condition and symptoms presented by the patient, and the amount of annoyance the fistula gives.

In cases of amebic dysentery there is usually an apparent cure in four weeks or less. It would not be wise, however, to close the opening at this time as periods of quiescence lasting some times months occur in the disease even without treatment. These patients should be advised to wait six or nine months, and if they are to return to tropical regions the opening should be kept open permanently to facilitate prompt and effectual treatment in case of reinfection.

In cases of simple mucous colitis, the opening may be

closed after mucous has been absent from the stools for several weeks and the bowel movements have become regular without irrigation or laxatives.

In cases of the various forms of ulcerative colitis too much stress cannot be laid on the advisability of keeping the fistual open for a considerable length of time. The only disappointments from the operation, so far as known, have followed too early closure. It is important in these cases to aid the colonic flushings by proper internal medication and judiciously selected articles of diet.

In cases where the operation has been performed for the relief of tuberculous ulceration, the fistula should be kept open permanently. When made for the relief of intestinal distention, caused by peritonitis or volvulus, the fistula may be closed as soon as the primary condition has disappeared. In other conditions the time of closure must be left to the judgment of the operator, as there are no statistics upon which to base conclusions. To close the fistula is usually simple and easy. The application of nitric acid or the actual cautery to the mucous lining has invariably and promptly been followed by closure of the aperture. If, however, it is deemed advisable, the stump of the appendix may be dissected out and the small abdominal wound sutured.

RESULTS.

In forty-four cases of dysentery there were six deaths, but none of them due to the operation. Two were from unsuspected tuberculosis, two from extreme ulceration of the bowel with chronic nephritis, one from exhaustion before the appendix was opened, and one from cerebral

disease three months after the operation. The remainder of the cases (38) are reported cured.

In sixteen cases of mucous colitis the reports are all favorable. In some of them, however, it is difficult to tell how much good was due to the removal of the appendix and how much to the effect of appendicostomy. The relationship between chronic appendicitis, with adhesions, and chronic muco-membranous colitis is very close, and the etiologic influence of the one on the other merits a wider discussion than is permitted by the limits of this paper. Suffice it to say that by appendicostomy we get rid of the appendix, whether it be the cause or effect of colitis, and at the same time give access to the parts for local treatment.

In the cases reported, where the operation was done for syphilitic ulceration, the patients appear to have been greatly benefitted if not permanently cured. In the cases of papilloma and carcinoma, the operation was performed only as a palliative measure. In the cases of volvulus and intussusception the operation was effectual.

REPORT OF AUTHOR'S CASE.

Mrs. X., aged 46, patient of Dr. W. S. Gordon, of Richmond, Va., admitted to St. Luke's Hospital June 14, 1906. History of typical attack of appendicitis about puberty. For thirty years had suffered with occasional pain in right iliac region. Two years ago had an attack of colitis. Recovered and remained well for twelve months and then had recurrence. Disease grew worse despite persistent and intelligent treatment. Was placed at one of the hospitals of this city where diet, rest, astringent and rectal irrigations were tried for some weeks without permanent benefit. During past six months had suffered constant abdominal pain, attended by profuse diarrhea, with loss of thirty-five pounds in weight.

Operation of appendicostomy performed June 20, 1906. Appendix was found atrophied and adherent, but was liberated and brought through the abdominal wound by the technique previously described. Two or three days later the appendix was amputated, its calibre dilated, a catheter inserted and irrigation of the colon begun. The patient was out of bed on the fifteenth day and was discharged on the 22d day after operation.

As long as the patient was in the hospital she did admirably, but shortly after her return home she had a sharp recurrence of her old symptoms. This was partly due to the nature of her disease, but largely accentuated by too heroic treatment. She was a physician and the wife of a physician, and as I was in Europe, they were left to their own resources, and, as is usual in such cases, owing to over-anxiety, they tried too many remedies. Finally, after correspondence with Dr. Tuttle, the patient was put on sulpho-carbolate of zinc and oil of turpentine, and the colon irrigated with a teaspoonful of salt and a teaspoonful of bicarbonate of soda to a quart of hot water (120° F.) for three days, followed by 1½ per cent. solution of ichthyol on the fourth day. This resulted in controlling the diarrhea and a gradual return to normal fecal movements. The appendicostomy fistula was kept open for three weeks after the mucous disappeared and then allowed to close. The patient has gained more than fifteen pounds in weight and believes herself cured.

Pylorospasm *

Twenty years ago the physician held undisputed sway in the treatment of digestive disturbances, and the suggestion that dyspepsia could be cured by surgery, when medicinal, dietetic and hygienic measures had failed, would have been regarded as an absurdity.

Ten years ago the surgeon took possession of the field, and for a time the operation of gastro-enterostomy was considered a panacea for all gastric disorders. It was found, however, that while the operation in some cases accomplished brilliant cures, in others it not only did not relieve, but actually increased, the patient's distress.

Today it has been demonstrated that chronic and recurring indigestion is rarely, if ever, due to functional causes, and cannot be cured by efforts to correct errors of secretion. It is almost invariably caused by organic disease of the stomach or other organs, and can be corrected only by operative intervention. In nine cases out of ten, while the symptoms are gastric, the cause is appendicitis, cholecystitis, pancreatitis, or duodenal ulcer; and while the treatment is surgical, the operation is not done on the stomach. A gastro-enterostomy will cure the symptoms due to an organic obstruction of the pylorus such as result from cicatricial contraction of an ulcer, because it relieves the condition by affording a new exit for the stomach contents. The operation will not cure, but will

aggravate, the symptoms due to a spasmodic obstruction of the pylorus such as results reflexly from nervous stimulation, because it overcomes the effort being made by nature to prevent the invasion of the intestines by irritating stomach contents. Obstruction of the pylorus may be organic or spasmodic. The first is mechanical and should be relieved by making a new exit for the stomach contents; the second is nervous and should be relieved by diagnosticating and correcting the cause which produces it.

Spasm of the pylorus, or pylorospasm as it is generally called, is a very common trouble. It is not a disease, but a symptom. It may be caused by rapid eating, by indigestible food, by an ulcer or other lesion of the stomach, but it is most frequently the expression of disease of some remote abdominal structure. How appendicitis or cholecystitis causes gastric symptoms has never been satisfactorily explained. It is believed that irritation transmitted to the stomach through the sympathetic nervous system causes an excessive secretion of hydrochloric acid. The resulting hyperchlorhydria causes spasm of the pylorus; the pylorospasm causes retention of food beyond the physiologic limit, and finally there comes motor insufficiency, food stagnation and dilation of the stomach.

The most prominent symptom of pylorospasm is a cramping pain in the epigastrium, which may last only a few minutes or may continue for several hours. In some cases the spasm may relax suddenly; in others it may terminate slowly and gradually. Some patients have attacks several times a day; others at intervals of weeks; and others still only once or twice a year. In the interval between attacks, the digestion may be normal.

During attacks peristalsis of the stomach is increased, but food cannot pass through the pylorus, and often relief comes only after vomiting. The patient usually diets strictly, and loses flesh and strength steadily from starvation and autointoxication.

During the last few years I have recognized, treated and cured a progressively increasing number of cases of pylorospasm. In no other class of patients, with possibly the exception of epileptics, is it necessary to be so thorough in preliminary examination and so patient in post-operative treatment. The real cause of the condition must be found, and after it has been removed the patient must be systematically treated until the hypersensitiveness of the pyloric muscle is relieved, and its spasm habit is overcome. This will be well illustrated by one of my first cases.

Miss E., aged 32, a thin, anemic and nervous patient, gave a history of chronic dyspepsia attended by frequent attacks of violent pain in the upper abdomen. A diagnosis of gall-stones was made and an operation advised. The abdomen was opened, the gall-bladder exposed, and it was found to contain several large gall-stones. They were removed, a drain was inserted, and the incision was closed. No examination was made of other abdominal organs. A week after the operation the patient had a return of her old pain, and the paroxysms became so frequent and distressing that her family was told that it was probable that a stone had been overlooked and it was advisable to re-open the abdomen and try to remove it. At the second operation the gall-bladder and ducts were carefully palpated, with negative results. The stomach was then delivered and examined. The pylorus was found hard and rigid, with a lumen which would not admit the tip of the finger. While handling it in search of evidences of ulceration, the spasm suddenly gave way, the tissues became soft and elastic, and a finger could readily be invaginated through the opening. Then, for the first

time, the nature of the case was comprehended. The stomach was normal; the gall-stones were an innocent coincidence; the cause of the pylorospasm must be found elsewhere. The appendix, which, until then, had not been suspected of disease, was brought into view. It was inflamed and contained several enteroliths, and was removed. The patient recovered from the operation, but for some months had recurrence of pain after any imprudence in eating. She was carefully and intelligently treated by her family physician and is now completely well.

This paper is intended only to be suggestive. Its purposes are to impress:

First.—The necessity of differentiating between gastric symptoms due to organic disease of the stomach and those reflex from other organs.

Second.—The impropriety of performing a gastroenterostomy for spasm of the pylorus.

Third.—The advisability, at the time of operation, of examining all abdominal organs and correcting every abnormality, lest the obvious may not be the real cause of the symptoms.

Fourth.—The importance of the post-operative and post-hospital treatment of patients to overcome the spasm habit of the pyloric sphincter.

Etiology and Symptomatology of Gall Stones *

The liver is the largest and one of the most important organs of the abdomen. Its most obvious function is the production of bile. One of its most essential duties, however, is the destruction of the bacteria coming to it from the digestive tract through the portal system before the blood enters the systemic circulation by way of the hepatic vein. The liver secretes between 20 and 30 ounces of bile every 24 hours. Healthy bile was at one time supposed to be free from germ life and even to have mild antiseptic properties : more recent and accurate investigations, however, show that it always contains a moderate number of bacteria and that it is a good culture medium.

Most of the bile produced by the liver passes directly to the duodenum through the hepatic and common ducts. A small proportion passes up the cystic duct to the gall-bladder where it is stored and somewhat modified by absorption and admixture with mucous. When stimulated the gall-bladder contracts and forces its contents back through the cystic duct to the general bile stream. Bile, on reaching the intestinal tract, stimulates pancreatic secretion, neutralizes the acid chyme of the stomach, emulsifies fat present in food, and excites the peristaltic action of the bowel. When bile reaches the cecum the fluid element is absorbed and returned to the circulation

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* Part of a Clinical Lecture delivered at the University College of Medicine, Richmond, Va., November, 1912.

while the pigments and waste products are excreted in the feces.

The Gall-Bladder is a pear-shaped organ capable of holding about one ounce af bile. Its function is unknown and people seem to get along as well without it as they do with it. The amount of bile it is capable of holding is so small, compared with the total secretion of the liver, that it cannot act in an important way as a reservoir. Some think it acts as the air chamber to a fire engine, regulating the flow of the stream, others that it secretes mucous, which mixed with bile serves as a lubricant to the ducts. At any rate the gall-gladder, like the appendix, is a non-essential structure.

The Hepatic Duct begins at the transverse fissure of the liver. It is about two inches in length and one-sixth of an inch in diameter. It unites with the cystic duct to form the common duct.

The Cystic Duct is about 1½ inches long and ⅛ inch in diameter. Its mucous lining is thrown in crescentic folds which normally prevent the passage of a probe from the gall bladder to the common duct.

The Common Duct is about three inches long. It empties into the duodenum together with the pancreatic duct at the ampulla of Vater. The common duct is divided for description into three portions. The supra-duodenal, the retro-duodenal and the trans-duodenal. The supra-duodenal is about 1½ inches long. It runs downward in the free edge of the gastrohepatic omentum and forms the anterior boundary of the foramen of Winslow. The retro-duodenal portion of the duct is about one inch long and, as its name implies, lies behind the duodenum. In 40% of cases it runs in a grove on the head of the pan-

creas. In 60% of cases it passes directly through the pancreatic tissue. The trans-duodenal portion of the duct is about ½ inch long and passes obliquely through the wall of the gut to open in common with the pancreatic duct at the ampulla of Vater. The first portion of the common duct is easily accessible to palpation and manipulation as it can be raised by hooking the fingers in the foramen of Winslow. The second and third portions of the common duct are difficult of access and it is often necessary to make an incision into the duodenum to approach them surgically.

The Pancreas is formed in the embryo by two buds. It retains to a certain extent its primitive form and has two lobes which are drained by two ducts having separate openings into the duodenum. The duct of Wirsung is the main drain of the pancreas in 83% of individuals. It opens into the duodenum at the ampulla of Vater together with the common duct. This has been termed an unfortunate association of terminal facilities between the liver and pancreas, as interference with traffic in one system may block the service in the other. The duct of Santorini is the main drain of the pancreas in 12% of individuals. When the other duct is obstructed it is capable of acting as the main drain in 54% of the cases. It may open into the duodenum a short distance below the pylorus.

Gall-Stones are concretions formed in the gall-bladder. It is possible they may form in the hepatic or common duct but such cases are extremely rare. Gall-stones are not calcareous but fatty substances, as can be demonstrated by subjecting one to the heat of an open flame when it will soften and burn much like sealing wax. Gallstones are composed of cholesterine, bile pigments

and lime salts. The proportion of these elements are not constant and as a result the color of the stone may vary from light yellow to dark green or black.

Gall stones vary in size and number; they may be as small as mustard seeds or as large as goose eggs. If multiple they are often faceted from pressure one against another. Numererous cases have been reported where several thousands have been found in one patient.

Gall-stones are formed in from a few days to a few weeks. They are usually all formed at the same time and are symmetrical although cases are sometimes seen where there are several crops of stones as shown by the entirely different color, size, shape and proportion of chemical constituents.

Gall-stones frequently migrate from the gall-bladder. They often pass in the cystic, hepatic and common ducts. They frequently reach the duodenum either by way of the ducts or through a fistulous opening between the gall-bladder and bowel. They are sometimes vomited and often pass at stool. Occassionally they enter the appendix and sometimes they lodge at the iliocecal valve or some other portion of the intestinal canal producing obstruction.

The cause of the gall-stone formation has been a question giving rise to much discussion. It is a fact that 50% of gall stones occur in patients over 40 years of age; that 75% of all gall stones occur in women and that 90% of these women have borne children. It is also a fact that 33% of people with gall-stones give history of typhoid fever and 25% give history of having had an attack of appendicitis. Finally, it is a fact that gall-stones are more common in people who lead sedentary

lives, eat and drink imprudently and suffer from constipation and obesity.

The theory of the etiology of gall stone disease at present accepted is that the condition is due to the combination of predisposing and essential causes. The predisposing causes are supposed to be factors which produce stagnation of the biliary current, under which must be considered age, sex, pregnancy, tight lacing, obesity, constipation, imprudence in eating and drinking, lack of exercise and fresh air and other errors in the habits of living.

The essential cause is supposed to be the infection of the gall-bladder and the production of chronic cholecystitis. The microorganisms most often responsible for the infection are of the colon group, including the typhoid bacillus. Welsh has found the typhoid germ in the gall-bladder seven years after an attack of typhoid fever, and clumps of bacteria are frequently found in the nucleus of gall-stones. Attempts to produce gall-stones artificially in animals by infection have usually failed because the resulting inflammation has been so acute as to produce destruction of the mucous lining of the gall-bladder. Success has only been secured when the germs employed were so attenuated as simply to produce irritation.

The avenue by which the bacteria reach the gall-bladder is a matter of dispute. Some authorities claim that they pass directly from the intestinal tract through the common duct. This theory is favored by the observation of Bond that particles of indigo carmin placed in the rectum were carried up by a reverse mucous current and could be demonstrated after a certain time in the gall-bladder; also by the observation that the bacillus prodigiosus introduced within the anus could be recovered in

two hours from the animal's mouth. Opposed to this theory are the facts that the duodenum is usually sterile and that infection would travel with difficulty up the common duct in opposition to the rapidly flowing stream of bile.

Other authorities claim that the infection reaches the liver through the portal blood and is conveyed to the gall-bladder by the agency of the bile. In ordinary health the blood going to the liver through the portal system contains many bacteria picked up in the passage through the digestive tract. The reason for its going through the liver prior to return to the general circulation is to permit the annihilation or attenuation of its infection. If this infection be present in health it exists to a much greater extent in disease. Proctitis, colitis, enteritis, appendicitis, typhoid fever, ulcer of the duodenum or stomach, abcess of the spleen, inflammation of the pancreas or lesion of the liver itself, would all throw an additional amount of infection in the blood stream. As a result the bile would be infectious and chronic cholecystitis with gall-stone result. This theory explains the frequency with which gall-stones follow appendicitis, typhoid fever, duodenal ulcer and other diseases of the gastro-intestinal tract.

Post-mortem examinations made by pathologists of all patients dying in large hospitals and the examination of the upper abdomen by surgeons as a routine measure in abdominal sections have shown the presence of gall-stones in many cases where they were not suspected to exist. It is stated by several reliable authorities that about one person in ten has gall-stones. If this be true, the condition should be constantly borne in mind when examining a

patient with abdominal trouble, and both physician and surgeon should make a thorough study of the symptomatology of the disease in order that he may recognize it early and treat it properly.

Indigestion is the earliest and most frequent symptom of gall-stones. It is not produced by imprudence in eating, comes on without definite relation to taking food, and is usually relieved by vomiting.

Pain located in the epigastrium and radiating to the back is another fairly constant symptom. It is dull aching in character and varies in intensity. It is increased when the gall-bladder is distended and relieved when it is emptied.

Tenderness over the gall-bladder can generally be elicited by spreading the fingers of the left hand over the patient's ribs and hooking the thumb under the costal margin. When the patient takes a deep inspiration, the diaphragm forces the liver down and the sensitive gall-bladder coming in contact with the examiner's finger causes a sudden catch in the patient's breath.

Colic is a familiar symptom. It is due to the sudden blockage of the duct and the muscular contraction of the gall-bladder to overcome the obstruction. Colic is abrupt in its onset and sudden in its relief. The patient is doubled up in agony, and there is faintness, nausea and vomiting.

Jaundice is not a very frequent symptom of gall-stones. According to Murphy it only occurs in one out of seven cases. Jaundice is due to obstruction of the common duct. Bile, unable to escape into the duodenum, exerts a back pressure on the liver and there is rupture of the biliary radicles. Bile is taken up by the lymphatics and

carried to the general circulation causing the characteristic discoloration of the eyes and skin, and giving, sooner or later, the symptoms of cholemia.

Obstruction of the common duct may be caused by it being plugged by a stone from within or compressed by a growth from without. Attention has been called to the fact that the retro-duodenal portion of the common duct lies in or on the head of the pancreas. Disease of the pancreas, whether inflammatory or malignant, which causes it to be enlarged, will by pressure obstruct the common duct and produce jaundice. It is a fact which cannot be too strongly impressed that most cases of gall-stones are not attended by jaundice and most cases of jaundice are not due to gall-stones. The differentiation of jaundice due to gall-stones and jaundice due to malignant disease is based on the fact that jaundice due to gall-stones is usually preceded by colicky pain, while jaundice due to cancer is not attended by pain. Also by the fact that jaundice due to gall-stones varies in intensity, deepening after an attack of pain and then clearing up, while jaundice due to malignant disease gradually gets deeper and deeper and never lessens. There is yet another fact, first emphasized by Courvoisier namely, that in jaundice due to a stone in the common duct the gall-bladder is contracted and cannot be palpated, while in jaundice due to malignant disease the gall-bladder is distended and can usually be felt.

Fever is a frequent symptom of gall-stone disease, due to an increase in the acuteness of infection. It is marked by its rapid rise and abrupt termination. If the range of the temperature be charted, it gives an appearance which

Moynihan calls "The Steeple Chart" and Murphy terms "The Temperature Angle of Cholangic Infection."

Tumor of a movable pear-shaped mass which can be palpated in the region of the gall-bladder indicates either obstruction of the cystic duct with a stone and distention of the viscus with mucous, or the obstruction of the common duct by cancer and the distention of the organ with bile.

It sounds like a paradox, but it is a deplorable fact that most cases of gall-stones are treated by the physician for indigestion, and that many cases of supposed gall-stones operated on by surgeons are the victims of some other disease. Mistakes in the diagnosis of gall-stones are due to all the early symptoms being referred to the stomach and the supposedly pathognomic symptom of jaundice being most frequently due to cancer.

Diagnosis and Treatment of Gall Stones*

Cases of gall-stones have been recognized and treated for many centuries, but until Marion Sims did the first premeditiated operation for the removal of a biliary concretion, some twenty-six years ago, the disease was considered a medical one and not amenable to surgery. The belief that gall-stones could be relieved by diet, exercise, mineral waters and drugs has been so long entertained that the laity and many of the profession still think that surgery should be resorted to only when continued jaundice or profound sepsis threaten the life of the patient. This fallacy is being dispelled and no stronger or more conservative statement of the present concensus of opinion can be cited than that of Kocher, who states in his recent book that while he does not go to the length of saying that gall-stones "belong" to the surgeon, as possession is nine points of law, and hence they are the property of the patient; still, "If the patient prefers to wait in suffering and pain for a stone to work its way down *per vias naturales* he is but employing his personal privileges. But in the present day a surgeon is certainly justified in telling a patient with gall-stones that by an operation he can be quickly and safely cured of his trouble, and be saved from an eventual danger more rapidly and more easily than by any other treatment."

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* Read at the meeting of the Tri-State Medical Association of the Carolinas and Virginia, Danville, Va., February, 1904.

The results of the work of Mayo, Kehr, Robson and others show that early surgery in the biliary tract, like early operation for appendicitis, is safe and easy; while late surgery is difficult and desperate; and lead to the inevitable conclusion that in all cases of gall-stones an early effort should be made to restore health, rather than a late effort to save life.

The importance of gall-stones can only be recognized after an appreciation of the frequency with which the disease exists. Naunyn, in post-mortem examinations of a large number of bodies, found them in 10% of all cases. The reason why a diagnosis of the condition is not made oftener is because in 85% of cases the stones are quiescent and give rise to no trouble, and in the remaining 15% of cases the symptoms originating from gall-stones are frequently misinterpreted and attributed to gastritis, intestinal indigestion, chronic appendicitis, loose kidney or other causes.

The surgeon who constantly bears in mind the possibility of cholelithiasis in every patient with obscure abdominal disease, will be the man to make the diagnosis of gall-stones in the largest proportion of cases. Looking for gall-stones will not give them to a patient, but finding them will usually bring relief through an appropriate operation.

Gall-stones are usually secondary to infection of the gall-bladder with the colon bacillus or the germ of typhoid fever. They are usually found at or after middle life, are three times more common in women than in men, and are most often observed in those who lead sedentary lives, wear tight clothing or eat to excess. The symptoms of gall-stones depend largely on the location of the

stone. If the calculus is in the gall-bladder or cystic duct the symptoms are local, and consist of spasmodic pain, attended by tenderness in the epigastrium, and frequently distention of the gall-bladder sufficient to make it perceptible on palpation. If the stone is lodged in the hepatic or common duct in addition to the foregoing local symptoms there will be constitutional disturbances, such as jaundice, due to the absorption of bile by the blood.

The diagnosis of gall-stones is easy when there is characteristic colic, local tenderness, nausea and vomiting, and more or less pronounced jaundice, but unfortunately the co-existence of these classical symptoms is rare, and the surgeon who hesitates to operate because one or even two of them are absent will fail to give relief to many patients.

In the record of a large number of cases where gall-stones were found only one-half of the patients gave a history of biliary colic and only one-fifth a history of marked jaundice.

Ochsner, in describing the symptoms that will most constantly lead to the correct diagnosis when gall-stones are present, classifies them about as follows:

1st. Digestive disturbances such as weight and burning in the stomach, and distention of the abdomen, after eating.

2nd. Dull pain, beginning in the epigastric region, extending to the right along the level of the tenth rib, and distributed to the spine and right shoulder blade.

3rd. Tenderness upon pressure at a point between the umbilicus and the ninth costal cartilage of the right side.

4th. History of having had one or more attacks of typhoid fever or appendicitis.

5th. Slight yellow discoloration of the skin, not suffi-

cient to be recognized as icterus, but still sufficient to be perceptible upon close inspection.

6th. An increase in the area of liver dullness.

7th. A swelling of variable size sometimes seen opposite the end of the ninth rib.

In conclusion Ochsner says: "Of course if we have added to these symptoms the biliary colic, followed by distinct jaundice, and possibly the passage of biliary calculi, our diagnosis is still further confirmed, but even without these three last conditions we must make the diagnosis ordinarily, or we will miss the diagnosis in most patients suffering from gall-stones."

It is obviously impossible in some cases to make an absolute diagnosis, but the surgeon belongs to an unhappy branch of the profession whose business it is to look for trouble, and when a case is referred to him with symptoms in the region of the liver that have defied medical treatment, he should open the abdomen, ascertain the nature of the disease and give relief by an appropriate operation.

In following the above practice I am free to admit I have failed to find the suspected stone in about one-fourth the cases operated on, but I have never failed to find "trouble." If there was no stone there was cholecystitis, flexon of the gall-bladder, cancer of the liver or some other pathologic condition. If there was no operation to be done for stone there was the equally important work of draining the gall-bladder for infection, or suturing it in a position to correct angulation and prevent residual bile, or anastomosing it to the doudenum to overcome irremediable obstruction of the common duct from malignant deposit.

Operations on the gall-tract have recently been rendered easier and more accurate by an improved technique. Just as the method of exposing the kidney for operative manipulation has improved so has the method of exposing the liver. When surgeons first began to do work on the kidney an incision was made and the work done through it on the wabbling kidney beneath. Now the kidney is delivered through the wound and the work done on it while it is fixed in position and under actual inspection. So, too, in hepatic surgery. Formerly the incision was made and the work attempted in an inaccessible location. Now the patient is placed on the table in a slightly reverse Trendelenburg position, with a sand bag beneath the back, thus carrying movable viscera towards the pelvis and making the liver itself more prominent. An incision is made beginning near the ninth costal cartilage of the right side and running vertically downward through the outer border of the rectus muscle. If complications are met with and more working space is required the opening may be enlarged by a second incision beginning at the upper angle of the first, and extending obliquely upward and inward to the tip of the ensiform cartilage. This last incision divides the skin and anterior and posterior sheaths of the rectus muscle, but does not sever the fibres of the rectus or the peritoneum, as these structures can readily be stretched by a retracter.

The anterior border of the liver is grasped by the right hand of the assistant and drawn first downward and then outward until at least one-third of the organ is delivered into the wound. This brings the gall-bladder practically outside of the body and renders the ducts straight and easily accessible. After opening the abdomen the gall-

bladder should be carefully palpated for stones. If it is tense with fluid it should be emptied before being incised. If the ducts are open this can be accomplished by gentle but firm pressure against the liver. If they are closed the fluid must be removed with a canula or aspirator. The gall-bladder should be opened whether stones are found or not, as it may contain biliary sand, thick tarry bile, or be chronically inflamed, and hence require drainage.

Before making the incision into the gall-bladder the general peritoneal cavity should be carefully protected from contamination by a well placed coffer dam of gauze. This can be effectively done by taking a piece of gauze two yards long, folding it into a strip the width of the hand and rolling it into a bandage. This is unrolled and systematically packed in the abdomen, beginning at the left side of the gall-bladder, then beneath it and finally to its right.

The incision in the gall-bladder should be in the fundus and of sufficient size to introduce the index finger. Stones found in its cavity should be removed with a scoop devised for the purpose or with a dull uterine curette.

The question of the patency of the cystic, hepatic and common ducts will next have to be determined. It is well to bear in mind that they may contain a stone and still be capable of transmitting bile, and again that they may contain no stone but be temporarily occluded by swelling of their mucosa.

There is no well determined procedure to settle this important point. Some surgeons rely largely on the patient's previous history, but this is uncertain, as Kehr has

found stone in the common duct in a large number of cases that had never manifested jaundice. Other operators endeavor to pass a probe through the ducts, but this is a bad practice, as experiments in the dead house show that a probe will not pass through the *normal* cystic duct, owing to a valve like arrangement of the mucous lining. Fergusson and Van Hook endeavor to inject water or air through the ducts, but this method is time consuming, requires special apparatus and endangers sepsis. Weir adopts the plan of dropping a pellet of methylene blue in the gall-bladder just as he completes the operation, stating that if the ducts are open the coloring agent passes into the intestines and stains the feces, but if the ducts are closed the result is negative. The method is safe and ingenious but does not help to solve the problem while the patient is on the table.

Practically the best that can be done is to palpate the ducts carefully and systematically from their origins in the gall-bladder and liver to their termination in the duodenum, which can be satisfactorily done by introducing two forefingers into the foramen of Winslow, behind the ducts, and making pressure on them with the thumb from the front. If a stone is found it should be removed by incising the duct; if one can not be detected the duct should be left intact.

Owing to the varying location of gall-stones and to the many complications that result, a great number of operations have been devised to meet the different conditions encountered. Gall-tract surgery is young compared with surgery of the pelvis and of the appendix, and the indications for certain methods have not yet been definitely settled.

Cholecystotomy consists in the incision of the gall-bladder, the removal of its contents and the immediate closure by suture of the opening in the viscus. The operation is indicated for stones in a healthy gall-bladder with unobstructed ducts. It is called the "ideal operation" by its advocates and the same term is applied to it satirically by its opponents. The cases in which it is safe to apply the method are very exceptional.

Cholecystendesis consists in the steps described in the operation of cholecystotomy, except that in place of dropping the gall-bladder back in the abdomen, the fundus is anchored by sutures to the abdominal incision. The object is either to correct flexion or to place the organ in such a position that it will be accessible in case it is found necessary to open and drain it.

Cholecystostomy consists in the incision of the gall-bladder, the removal of its contents and the subsequent drainage of its cavity through the abdominal incision. The fistulous opening may be formed either by sewing the cut edge of the gall-bladder to the parietal peritoneum with chromicised catgut, or preferably, by tying a tube in the opening of the gall-bladder with a purse string suture and bringing it through the abdominal incision, either trusting to adhesions forming around the tube before its detachment, or bringing the gall-bladder in contact with the under surface of the wound by two suspension ligatures. The operation of cholecystostomy is indicated in gall-stones complicated by acute or chronic cholecystitis and is the method applicable to the majority of cases. It prevents accumulation of fluid in the diseased viscus, affords exit for an overlooked stone, and cures inflammation of

the gall-bladder and ducts by providing free and pro-
longed drainage.

Cholecystectomy consists of the removal of the entire
gall-bladder. The operation can be done with compara-
tive ease if the cystic duct be first ligated and divided, and
the viscus freed from the attachment to the liver from
behind forwards. The indications for the operation are
yet unsettled. There is no doubt that it can be done with
low mortality, but the question is as to the ultimate re-
sults that follow it. Davis, of Omaha, and others claim
that it avoids a fistula with the attending long convales-
cence, removes a useless organ, prevents the possibility of
stones reforming, and gives the patient the best guaran-
tee of complete restoration to health. Richardson, of
Boston, at one time an enthusiastic advocate of the opera-
tion, now condemns it except in selected cases, as the re-
moval of the gall-bladder prevents its utilization as a
drainage tract, and patients after the operation frequent-
ly have a recurrence of symptoms which, owing to the ab-
sence of the gall-bladder, he is at a loss to know how to
re-relieve. A conservative statement of the present opin-
ion of the profession in regard to cholecystectomy is that
the operation should be limited to cases of irremedial
obstruction of the cystic duct, and to cases of gangrene
or malignant disease of the walls of the gall-bladder.

Choledochotomy consists in the incision of the common
duct for the removal of a stone. The term is also some-
times used to describe incision of the other bile ducts.
When the stone is lodged at the opening of the common
duct into the intestine it is best reached by McBurney's
trans-duodenal route; otherwise it is more accessible by
approaching the duct by the external route to the right

of the duodenum. An incision is made in the duct parallel to its long axis and the stone removed either complete or fragmented. Halstead and others advise suture of the opening, but the majority of surgeons state that this procedure is unnecessary, and the present practice is simply to drain Morrison's pouch with a tube and gauze.

Cholecystenterostomy consists in the anastomosis of the fundus of the gall-bladder to the duodenum, preferably by means of Murphy's button. The operation is indicated for irremedial obstruction of the common duct from cancer or other causes, and relieves jaundice by affording a new avenue by which bile can pass from the liver to the intestinal canal.

Analysis of the
Last Fifty Cases of Goitre Operated On at St. Luke's Hospital *

Nineteen years ago when the University College of Medicine was established I was appointed assistant to my father, and my principal duty was to provide material for his weekly clinic. On two or three occasions I had a case of goitre for him, but he always found some excuse for not operating. Finally one night he called me into his office and said: "Stuart, don't give me any more cases of goitre in my clinic. I once operated on a case and it was the most bloody, barbarous and unsurgical procedure I ever attempted. Every man must be taught by his own experience, but if there is one thing you can learn from me it is not to operate for goitre."

This advice was good for its day and generation. The great Kocher's mortality in his first seventy cases of simple goitre was 40 per cent., and Charles H. Mayo's mortality in his first sixteen cases of ex-ophthalmic goitre was 25 per cent. It is no wonder that at one time the operation was regarded as unwarranted by the majority of surgeons, and it is not surprising that there are still to-day some among the older practitioners who hesitate to advise a patient with goitre to seek operative relief except as a last resort.

Times have changed and the once formidable opera-

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* Read at the meeting of the Medical Society of Virginia, Richmond, Va., October, 1911.

tion has been rendered comparatively simple and safe in experienced hands. Kocher, with a courage that seems marvelous to the present generation of surgeons, persevered in his work until he finally established a technique that has *reduced the mortality in his last one thousand operations for goitre to four-tenths of one per cent.*

This was accomplished by:

1. Early operations on more favorable cases.
2. Improved aseptic methods to prevent infection.
3. More skillful administration of anesthetics.
4. An exposure which gave ability to control hemorrhage and avoid injury to certain important structures of the neck.

Six or seven years ago I became convinced from Kocher's writings that the operation of partial thyroidectomy was advisable in certain conditions. I have now operated on more than one hundred cases of goitre, embracing practically all types of the disease without a single death and with most satisfactory symptomatic results.

Despite the low mortality of the operation, as reported by numerous surgeons, I do not think a patient should be treated surgically until medical measures have been tried and proven to be inefficient. From personal observation I am satisfied that at least one-half of all patients suffering with both simple and ex-ophthalmic goitre will get well without operation. Whether their recovery is due to the remedies prescribed by the physician or to the inherent tendency of the system to overcome an abnormality is not a material question. The practical fact is that these patients should be treated along accepted lines and given a reasonable time to see what Nature will do for them before they are subjected to a surgical

risk. If, however, they fail to improve or their symptoms get worse, then an operation should be advised before complications develop, or incurable structural changes occur in the heart, eyes or other organs. In other words, the surgeon should not operate on a case too soon, and the physician should not treat a case too long. It is a pity that there is not a better understanding between the physician and the surgeon in the treatment of the disease, as each has a distinct and separate field of work, and each accomplishes results the other could not hope to secure.

The surgeon should not underestimate the value of medical treatment. He should remember he sees only the cases in which failure has resulted and is ignorant of the cases in which cures have been effected. On the other hand, the physician should not criticise the surgeon for operating on so many patients. He should remember that practically all his cases have been treated medically without success and have been referred to him because they could not be cured without the use of the knife.

The medical treatment of simple goitre consists in placing the patient under the best possible hygienic conditions. This is especially the case in the symmetrical enlargement of the thyroid gland which is frequently seen in girls about the age of puberty. The patient should have proper food, pure drinking water and an abundance of fresh air. Regular hours of rest should be prescribed and over-exertion and mental excitement carefully guarded against. In the parenchymatous type of the disease the internal administration of an active preparation

of thyroid extract does much good. If it fails, arsenic and iodide of potash should be tried. The local use of tincture of iodine, especially when applied with cataphoresis, is a remedy of recognized value. As simple goitre causes mechanical symptoms, the patient is often the best judge as to when the disfigurement or discomfort it produces is sufficient to justify an operation. The danger of malignant degeneration, however, must not be left out of consideration.

The medical treatment of ex-ophthalmic goitre consists primarily in rest. If possible, the patient should be placed in a hospital and for a time confined to bed. An ice-bag over the heart is often of temporary benefit. Roger's and Beebee's serum gives good results in selected cases and should be used where indicated. Forcheimer reports cures from neutral preparation of hydro-bromate of quinine. He advises that it be given four times a day in five-grain doses. If there is no improvement in forty-eight hours he adds one grain of ergotin to each capsule. Belladonna given hypodermically in the form of atropia is a remedy of recognized value. X-Ray exposures sometimes result in marked benefit when everything else fails. The local use of iodine and the internal administration of thyroid extract are, of course, to be avoided.

If medical treatment fails to effect a cure in a reasonable time, then the case should be treated surgically. Delay is more dangerous in exophthalmic than in simple goitre as the symptoms are not due to pressure but to poison, and if hyperthyroidism is permitted to continue

there will be both increased risk and less satisfactory results from the operation.

If it is decided to do a partial thyroidectomy, it is not well to tell the patient in advance the day and hour fixed for the operation. In some cases where there is great fear of the operation it may be proper to practice the method of Crile which he calls "stealing the gland." The patient is told that before resorting to an operation it has been deemed best to try the "Inhalation Treatment." Every day at a certain hour the anesthetist goes to the patient's room, places a mask over his face and for ten minutes allows him to inhale some one of the essential oils, such as eucalyptus. The day set for the operation, the relatives, of course, being informed of what is to take place, the treatment is given as usual, only ether or chloroform is slowly substituted for the oil and the patient put to sleep without knowledge that the operation will be done that day.

The operation is most conveniently and safely performed with the table in a reverse Trendelenburg position. The elevation of the patient's head causes a certain degree of anæmia which reduces the tendency to bleed and lessens the amount of the anesthetic necessary to produce unconsciousness.

A transverse collar incision is made through the skin and platysma over the most prominent part of the goitre, and these two structures reflected to expose the underlying muscles. The sterno-hyoids and sterno-thyroids are separated in the middle line to expose the gland. This may give sufficient room to permit the delivery of the tumor, but often it is necessary to divide the muscles

transversely near their upper insertion in order to give a safe working field.

If the goitre is of the circumscribed variety, the encapsulated mass should be enucleated, the bleeding arrested and the cavity closed by buried sutures. If the goitre is of the diffuse variety, the affected lobe and isthmus should be excised by ligating the superior and inferior thyroid arteries and dissecting it from the posterior capsule.

Hemorrhage should be minimized by catching vessels before or immediately after division. Removal of the parathyroids should be avoided by preserving the posterior capsule which covers them. Injury to the recurrent laryngeal nerve should be guarded against by carefully exposing the inferior thyroid artery and ligating it close to the pole.

After tying all bleeding points, drainage should be inserted, the divided muscles sutured and the skin neatly approximated.

In order to bring out some interesting and practical facts with reference to goitre, I have made a brief analysis of the last fifty cases operated on at St. Luke's Hospital. As only white patients are admitted to the institution nothing with regard to the influence of race on the occurrence of the disease can be deduced. I am satisfied, however, from my experience in other hospitals that goitre develops as frequently in the negro as in the caucasian.

The fifty cases came from six different states. The number is so few and the territory covered so large that no conclusions are possible with reference to the influence

of geographical location. Four-fifths of the cases came from cities of 10,000 population, or over.

Of the patients, seven were men and forty-three were women, showing that the disease is more frequent in the female. The youngest patient was seventeen and the oldest sixty-one, the average age being thirty, showing that it is a disease of middle life.

Thirty-one cases were simple goitre, causing only mechanical symptoms. Nineteen were of the ex-ophthalmic type attended by marked symptoms of hyperthyroidism. The proportion of the latter to the former is much greater than usually reported and shows that the profession in my territory is not yet educated to the point of referring early and easy cases to the surgeon, but as yet only send the patient whose need is urgent.

In thirty-six cases the operation was on the right lobe, in seven on the left, and in seven on both lobes.

The greater frequency of the disease on the right side of the thyroid as compared to the left is noted by all observers, but so far no satisfactory explanation on either anatomical or physiological lines has been given.

The anesthetic employed was cocaine in one case, chloroform in thirty cases and ether in nineteen cases. Cocaine was used in the one instance because the patient was obese, had a bad heart and protested against taking a general anesthetic. Chloroform and ether were used in the other forty-nine cases.

From careful observation I am convinced that patients with goitre take a general anesthetic as well as any other class of cases and, as the operation can be done more rapidly and thoroughly with less strain on the patient and the surgeon, I advocate its use unless there be some

special contraindication. Whether the agent employed be chloroform or ether should be decided not by considering the anesthetic but the anesthetist. In the first of the series reported I employed a man who had great experience in giving chloroform. He left my service and was replaced by a woman who had long training in the administration of ether. In the hands of experts I found both agents safe and satisfactory.

In the fifty cases reported, fourteen operations were enucleations of circumscribed tumors, and thirty-six were excisions of enlarged lobes. The amount of the gland removed varied from a slightly enlarged lobe weighing one or two ounces to a huge mass weighing seven pounds. The average time taken to complete an operation was thirty minutes. The average confinement of the patient to bed was seven days and the average stay in the hospital was two weeks.

The Post-Operative Complications were as Follows:— One patient had huskiness of the voice for a week or ten days, showing I had irritated but not permanently injured the recurrent laryngeal nerve.

One patient had infection of the wound due to the imperfect drainage of a large cavity left after the dislocation of an intrathoracic goitre.

One patient had a severe hemorrhage shortly after recovery from the anesthetic, requiring the wound to be reopened and the bleeding arrested. This accident was probably due to including some muscular tissue in one of the ligatures, which contracted and pulled the suture off.

Two patients had hyperthyroidism, one mildly, the other severely. They both recovered in forty-eight hours

Whether the symptoms were due to absorption of the thyroid juices from the wound or whether they were due to "psychic excitation," as claimed by Crile, I do not know The surgeon should try to minimize the frequency and severity of this complication by handling the gland gently during the operation to avoid expressing its juices, and also by endeavoring to allay the patient's fear before the operation to avoid the possibility of hypersecretion from psychic influences. If pain, fright or mental emotions are capable of causing hyperthyroidism, it is an argument in the favor of the use of a general anesthetic.

Not long ago I had a case at the Virginia Hospital which strongly substantiated Crile's theory. The patient was a woman on whom I had operated two years before for ex-ophthalmic goitre and had effected a symptomatic cure. She came back to the hospital for the repair of the perineum and the correction of a displacement. When the time came for the operation she tried to back out, but I urged her on, and she went to the anesthetizing room in a bad state of fright. The operation was simple and uncomplicated, but in a few hours she developed high fever, was wildly delirious and her heart was so rapid that her pulse could not be counted. Here was a clear instance of hyperthyroidism developing from the excessive secretion of the thyroid gland stimulated by the patient's psychic condition. In this case there was no possibility of thyroid juices being absorbed by fresh surfaces as the operation was not on the neck but in the pelvis.

The final results of the operations were as follows:— In thirty-one cases of simple goitre where the symptoms

were due to mechanical pressure, there was complete relief in every instance.

In the nineteen cases of ex-ophthalmic goitre where the symptoms were due to hyperthyroidism, there was symptomatic cure in sixteen cases, marked benefit in two cases and failure to receive any benefit in one case.

In stating that a symptomatic cure was affected in sixteen cases, I mean that the patients were relieved of nervousness, tremor, tachycardia, and digestive disturbances and that they regained their usual weight, strength and spirits. The ex-ophthalmos was improved in a few of the early cases, but remained as a permanent disfigurement in the majority of instances. All of the patients still seem to have some irritability of the nervous mechanism regulating the heart, for while the pulse rate is normal under usual conditions it temporarily becomes abnormally rapid on unusual excitement or exertion.

In the two cases reported improved but not cured, the symptoms all continue but in much less intensity. Failure to effect a cure was due to not removing enough of the thyroid gland. If in the future the patients are not satisfied with their condition a second operation can be done.

The amount of the thyroid secretion is not dependent on the anatomical bulk but on the physiological activity of the glandular tissue; hence, in every case it is a question with the surgeon of how much to take out and how much to leave in. If an error is made it had better be on the side of conservatism as it is easy to take out more and impossible to put back any of this tissue which has such an important effect on the physical nutrition and nervous equilibrium of the individual. Personally, however, I must say that with increasing experience I find myself

taking out more and more of the gland and have never seen any bad results.

In the one case reported where the patient received no benefit, the fault was in the diagnosis, not in the treatment, as the case was not one of hyperthyroidism but of neurasthenia. The patient was a woman of thirty-two, referred to me by a prominent specialist of this city. She had very prominent eyes and a goitre the size of a lemon. She was nervous, tremulous and suffered with tachycardia on slight exertion. I operated on her and removed the right lobe and the isthmus. My pathologist examined the specimen and reported that the tissue did not show the cellular hyperplasia usually seen in hyperthyroidism and he believed it was a case of simple goitre. A more careful review of the patient's history and symptoms made it apparent that the woman was a victim of neurasthenia and the goitre was but a coincident trouble. Failure to secure the expected benefit from the operation was a further corroborative evidence.

The Thyroid and Hyperthyroidism

A review of the history of surgery will show that at certain periods special study has been concentrated on a single organ. Disease of the pelvic organ, of the appendix vermiformis, of the liver and gall-tract, of the stomach and of the pancreas, have each in turn occupied the professional mind. At present the thyroid gland is the organ chiefly under consideration.

Much has been learned about its physiological function and pathological changes, but much is yet unknown. Brilliant results have been achieved in treating patients the victims of its diseases, but they have been obtained by relieving the symptoms rather than by removing the cause, or at the cost of a mutilating operation. The day will come when a satisfactory knowledge of the etiology of thyroid disease will enable us either to prevent its occurrence or to cure it by some less heroic measure than the violence of surgery, but the time is not yet.

From the conception of Claude Bernard of subtle agents known as internal secretions, down to the demonstration of the existence and composition of iodothyrin, the history of the thyroid gland has received many valuable, and some dramatic, contributions.

Paracelsus, in the seventeenth century, recognized the relationship between goitre and cretinism.

Schiff, in 1856, showed that complete thyroidectomy was followed by the death of the animal.

Gull, in 1873, described the symptoms of myxedema.

Sandstroem, in 1880, discovered the parathyroid glands, but did not distinguish their physiological importance.

Kocher, in 1882, demonstrated the fact that myxedema would develop after removal of the thyroid.

Moebius, in 1886, crystallized the work of Parry, Graves and Basedow, and proved that the syndrome previously described by them and believed to be a disease of the nervous system, was really caused by excessive thyroid secretion.

Gley, in 1891, separated the functions of the thyroid and parathyroids and proved that tetany following an operation was due to the loss of the parathyroids.

Baumann, in 1896, isolated a body containing iodine, possessing the physiological characteristics of the thyroid. To this substance he gave the name iodothyrin.

McCallum and Voegtlin, in 1908, proved the importance of the parathyroids in the control of calcium metabolism.

Such, in brief, are the more profound and epoch-making advances made in the study of the gland. They constitute a series, beautiful in its logical evolution, profound in its import to human welfare.

The function of the thyroid is carried out by an internal secretion. It reaches the general system of lymphatics, and its most important element has been demonstrated in the blood. The colloid material found in the follicles is regarded by some of the best authorities as peculiar to this gland. Chemically it is made up of iodo-

thyrin and thyro-albumin, the latter a nucleo-proteid containing no iodine, but rich in phosphorous.

Iodothyrin is a combination of a globulin with iodine. The compound is not found elsewhere save in the blood, where it may be regarded as directly derived from the gland. It is not at all certain that iodothyrin represents the total of the active principles of the thyroid, but it is at least true that its administration produces much the same effect as does the extract of the gland in the treatment of myxedema.

The thyroid gland is essential to life. Whatever be the nature of its control over body metabolism, it is a vital one. Kocher states that an individual deprived of the thyroid may live seven years. So quietly and modestly does this important organ do its work that the exact part it plays is still hidden. But it naturally lies somewhere between the two extremes, hypo and hyper-thyroidism. The former is seen upon removing the gland, leaving the parathyroids, the latter by feeding thyroid extract.

Thyroidectomy produces symptoms of a chronic cachexia. The metabolism of the body is depressed, heat regulation and gaseous interchange are at a low ebb. In the young growth is lessened and the skeletal system is dwarfed. The cells fail to reach their proper development and the connective tissue remains myxomatous, giving to the skin a dry, massive, elephantile appearance. The hair is coarse and shows deficient nourishment. The nervous system halts in development, and mentality does not rise above the level of the infant. Physically and intellectually the victim of thyroid poverty is less a man, more a beast.

At the other end of the scale stands the exophthalmic. Excessive feeding with thyroid extract produces symptoms of metabolic riot. Heat production and gaseous interchange are rapid. The body tissues are stimulated to a course of wasting dissipation. There are seen tremor, sweating, tachycardia, muscular weakness, loss of weight and feverish mental activity. The evidence of thyroid excess suggests the entrance of tragedy into the life of its subject.

The thyroid gland, then, has a special influence on the nervous system, the muscular system, the skin and epithelial structures, the osseous system, and on the sexual functions. It exercises a general influence on the metabolism of the body. Of the various hypotheses that have been advanced to explain its action, it is impossible at this time to say which is the true one. It may be that each contains an element of truth; it is not likely that all are wide of the mark. But, either as a neutralizer of endogenous toxins, or as a hormone stimulating other organs and tissues to activity, or by some other obscure but potent influence the thyroid is a pace-maker for the body.

It is a temptation to speculate as to what the future may have to tell of the thyroid and other ductless glands. Who can say how far the influence of these organs may be shown to parallel the lines of the great social hierarchy? Who can say that the dullard, the drone and the vast army of the inefficient and dependent are not, after all, but close cousins to the cretin or can deny that iodothyrin represents in some measure the baser ore, which worked in the fires of experience, is seen and known in that gift of the gods which we call genius? What is there in the history of science to make us doubt that some day

we will be able to read backward the broader history of
the world, finding in the correlation of physiological prin-
ciples the gall of Napoleon's ambition and the iron of
Caesar's hand?

Less than a generation ago, Billroth, Reverdin, Miku-
licz and Kocher, blazing the trail for those who were to
come after them, had one out of every four patients
operated on for goitre develop tetany. A description of
the symptoms given by one of the old authorities reads
as follows:

"Some days after thyroidectomy, ordinarily on the third
or sixth day, sometimes a little earlier or later, the pa-
tient was seized with convulsions of the extremeties, more
often the superior, which were sometimes preceded by
tingling in the fingers or twitching of the muscles. Usu-
ally chronic contractions appeared; the hands closed with
such violence that the nails often penetrated the skin. The
limbs were sometimes contracted so that it seemed that
they were going to break; even the diaphragm was at
times involved."

It is now well known that tetany is not due to removal
of the thyroid but of the parathyroid glands. Mayo
states that the danger of tetany in thyroidectomy under a
proper technique is no greater than that of pulmonary
embolism following abdominal surgery. Thyroidectomy
alone does not produce tetany; removal of the parathy-
roids alone does cause it. The symptoms of tetany are
not relieved by giving thyroid extract; on the other hand
parathyroid feeding does control them. Permanent cure
may be affected by transplanting parathyroid glands, but
a successful graft cannot be made unless there be a para-
thyroid poverty.

The parathyroid glands have been studied in the cat, dog, monkey, guinea-pig, rabbit, rat, horse, sheep, goat, ox, birds and man. Forsyth alone examined forty-two species of mammals and thirty-five species of birds. In man they are normally four in number, small, flat, soft, yellowish-brown bodies, lying along the posterior margin of the thyroid. McCallum states that their arrangement is so inconstant that a composite picture of many dissections shows them occupying every point in a band from top to bottom of the thyroid. Enlargements of the thyroid displace them out of all recognition in operation.

Chemically no predominating feature is found, such as the iodine of the thyroid gland. Berkeley and Beebe, however, obtained a nucleo-proteid and a globulin. The globulin is of no value in relieving tetany. But according to these observers, the nucleo-proteid will relieve tetany, when given by mouth, subcutaneously or intraperitoneally.

Before the role of the parathyroids in tetany was known, acute observers had recognized the low calcium content of the body in tetany and the efficacy of these salts in the control of the condition. Only recently McCallum and Voegtlin were able to line the metabolic perversion with its anatomical origin.

In contrast with the dramatic phenomena following sudden loss of the parathyroids, their slow destruction brings on gradual nutritional disturbances. These may terminate in death without symptoms of tetany, and this phase of parathyroid deficiency must be given due consideration in the physiology of these glands.

Much promising work is now being done to determine the relation of the thyroid gland with other organs, es-

pecially with other ductless glands. The association between the thyroid and the sexual organs, the pituitary body, the ardrenals, the thymus, the pancreas, and the parathyroids is substantiated by numerous facts.

The relation of the thyroid to the sexual function is shown by its congestion following coitus, at puberty and the menopause, in menstruation, pregnancy and lactation. The thyroid tends to atrophy with the decline of sexual power; and the cretin is marked by sexual blight.

The pituitary body seems to be in close alliance with the thyroid. In hypothyroidism it undergoes hypertrophy, apparently compensatory; while in acromegaly the thyroid is usually enlarged.

The adrenals are stimulated by the thyroid. In Addison's disease the thyroid is frequently atrophied, though it may be enlarged.

The thymus gland undergoes hypertrophy so frequently in exophthalmic goitre that it is regarded by some as a part of the essential pathology.

The pancreas is inhibited by the thyroid. In hyperthyroidism degenerative changes are frequently seen in it, and often sugar appears in the urine. On the other hand, primary pancreatic insufficiency is at times followed by marked alterations in the thyroid.

Such a collection of facts, inperfectly linked and but poorly understood, is more suggestive than practical. But it is prophetic of a better understanding of the subject.

At this time we are not able to say how the ductless glands are controlled. Though they respond to nervous influences, the functional results seen in grafts cut off from all demonstrable nervous connection would tend to show that they react to chemical stimuli contained in the

blood, known as hormones. The word "hormone" is derived from a Greek verb meaning to awake or excite. Their composition is largely unknown. They act by stimulating organs to activity and are not nutritive material to body cells. A very small quantity, therefore, is sufficient for the exercise of their function. The evidence seems to indicate that the correlation of the organs of internal secretion is accomplished through their medium. Responsive to the call of these quick messengers, the internal secretions are seen in a silent but ceaseless concert of action. It is probable that the ductless glands are grouped about the thyroid as the director of the physiological synergy. It brings to mind the words of Goethe in his tribute to Nature: "She is the unique artificer, from the simplest substances to the greatest contrasts, without appearance of exertion to the greatest perfection; to the most accurate precision, ever suffused with somewhat of delicacy."

The histological unit of the thyroid is a closed follicle lined with a single layer of columnar epithelium, elaborating a secretion. It is surrounded by lymph channels and blood-vessels lying in a connective tissue septum derived from the capsule of the gland. Some of the follicles have a lumen, others have none. Those with a lumen are filled with colloid material. The difference in histological structure of a normal thyroid and the thyroid of exophthalmic goitre is about the same as the difference observed in the resting and the lactating breast. The change is best represented by the term "hypertrophic parenchymatous thyroid." There is an increase in the number of active cells in the follicles or increase in the number of follicles, or both. For symptoms of hyperthyroidism to

arise, this increase must be sufficiently general to out-weigh any retrogressive changes that may be going on in other parts of the gland. There must also be ab-sorption of the secretion at a rate corresponding to the hyperplasia. Otherwise there follows retention of se-cretion, enlargement of the gland, and development of colloid goitre, with a subsidence of symptoms. Thus it is seen that exophthalmic and simple goitre are not separate entities, but stages of one process. Wilson says that a large percentage of cases of simple goitre will re-veal a history of definite signs of hyperthyroidism if in-quired into, and that every case of exophthalmic goitre is hypothetically destined, in order of pathological de-generation, to become a case of simple goitre. Having reached the colloid stage, one of the three possibilities may occur: either the condition may persist as simple goitre, or active hyperplasia and absorption may again arise with return of exophthalmic symptoms; or atrophic and degenerative changes may occur resulting in myxe-dema. In many cases of untreated hyperplastic thyroid, secretion ceases before retention has occurred. These cases show clinically either a return to normal or shade into myxedema with atrophy of the gland.

Seen in proper perspective then, changes undergone by the thyroid represent a series at first progressive, later regressive, but never assuredly resting. So closely do the symptoms follow the changes described that the history of the patient can be written by the pathologist in more than 80 per cent of cases.

Wilson summarizes the pathology about as follows:

Very early acute cases show hyperemia and cellular hyperplasia, at least in much of the gland. The recently

developed very mild, or moderately mild, cases of long standing almost always show some total parenchyma increase, but apparently not greatly increased functionating power. Later acute, moderate, severe and very severe cases show greater parenchyma increase, and in many cases, greater absorbable secretion. Cases which clinically are showing any remission of toxic symptoms, show somewhere within the gland more or less evidence of decreased function. Patients who have recovered from their toxic symptoms and are now suffering from long, previously acquired heart or nerve lesions show degenerative changes and large quantities of colloid that is probably not absorbable.

Outside of the thyroid gland itself, other tissue changes should be regarded as secondary. Any attempt to include as primary, functional and degenerative changes in the nervous, vascular and sympathetic systems will lead only to confusion.

Goitre was at one time thought to be a disease more or less limited to mountainous countries. It is now known to be widely disseminated. Goitrous districts were thought to be peculiarly free from exophthalmic goitre. This idea also had to be abandoned. There have always been many cases of goitre in our Southern States. Only recently, however, have patients with goitre been referred to the surgeon, owing to the fact that no promise of relief was offered them, and they remained under the care of their family physicians. Now that the results of surgery are more generally known, patients are coming to the hospital in such numbers as to add a new specialty to operative work.

Hyperthyroidism is seen most often in the third de-

cade of life. It is comparatively rare at either extreme, though Mayo has performed thyroidectomy for its cure in a child of seven. Females are more liable than males. According to Kocher, the disease is less common in the laboring class.

Through all the range of disease, physiology and etiology are inseparably interwoven and in exophthalmic goitre the cause must remain more or less obscure until we reach a better understanding of the function. Just as the whole truth is probably not embodied in any one of the present theories as to function, so it is likely that the cause is a complex one. The water and the soil, social circumstances and racial development may each contribute a factor.

Beebe distinguishes the following groups according to etiology: First, those following infectious diseases; second, those associated with pregnancy or disturbed menstrual function; third, those arising in the course of simple goitre; fourth, those following a period of physical or mental overwork, and fifth, those due to severe emotional disturbance or nervous shock of some kind.

McCarty assumes that the thyroid has retrogressed. The thyro-glossal duct formerly opened into the alimentary canal, and the thyroid may at one time have had a more extensive function than at present. He regards hyperplasia and hyperthyroidism as a reversion of the gland to its former type, though no attempt is made to point out the stimulus to reversion. Analogous processes are seen in supernumerary mammary glands.

Crile has pointed out that the thyroid plays a leading role in stimulating the emotions. This is shown by their increase upon feeding an extract of the gland, and by

dimunution on removal of part of the hyperplastic thyroid. The symptoms of exophthalmic goitre closely resemble those of fear. They have in common increased heart-beat, rapid respiration, rise in temperature, muscular tremor, protruding eyes and loss of weight. Crile believes that in exophthalmic goitre there is a reciprocal relation between the brain and the thyroid gland. The nerve supply of the gland enters along the walls of the blood vessels and maintains the connection between the gland and the brain. According to Crile's theory ligation is effective through breaking this nerve connection.

A clear conception of hyperthyroidism as a form of toxicosis will explain all the more important symptoms. Recalling the tendency of any toxemia to produce in time degenerative changes in various organs, a wide range of late and secondary characteristics are readily understood. When the enlargement of the gland is present, there may be introduced another factor, namely, pressure upon the neighboring structures. This may occur even though no external enlargement is apparent.

Tachycardia is probably the earliest, most constant and most reliable of any single symptom or sign. The pulse varies from 90 to 120, but may reach a much higher rate. It is usually over 100. It is the best index to the severity of the disease, and the best criterion of improvement or failure under any plan of treatment. The patient may or may not be aware of the abnormal heart action; usually, however, he is conscious of it. Murmurs, both cardiac and vascular, are frequently heard, but endocarditic changes are not themselves a component part of the thyroid heart. Examination of the blood reveals only a

relative lymphocytosis, not peculiar to hyperthyroidism. Blood pressure is an unreliable sign.

Exophthalmos is a comparatively late symptom. It is less constant than the rapid pulse. It occurs in about three-fourths of all cases. Numerous explanations have been advanced for the development of this symptom. It is not unlikely that the true cause has been located in the recent demonstration by Landstroem of another muscle in the orbital space. This investigator has described a cylindrical band of plain muscle arising from the septum of the orbit, inserted into the superior aspect of the bulb just posterior to the equator. Stimulation of this muscle through the sympathetic system would cause a widening of the lid slit (Stellwag's sign). As a consequence there arises incoordination of the movements of the lid and ball (Von Graefe's sign). A spastic condition of this muscle would also tend to overcome the normal tone of the rectus internus and thus upset the mechanism of convergence (Moebius' sign). Corneal anesthesia, inflammation and nystagmus are all seen at times, and are the results of the foregoing changes in the eye. Thus, if Landstroems muscle, stimulated by the sympathetic, proves to be the cause of this series of phenomena, they are associated directly with the toxicosis underlying sympathetic stimulation.

Goitre or enlargement of the thyroid gland occurs in about 80 per cent of cases. The size of the enlargement bears no relation to the severity of the toxic symptoms. Tachycardia and nervousness, on the contrary, are more liable to be exaggerated in association with the smaller tumors. Owing to the fibrous attachments to the trachea and esophagous, the tumor rises and falls with deglutition. Mobility is greater in the lateral than in the vertical

direction. Both lobes are enlarged but the right is usually larger than the left. Pressure on the trachea may cause dyspnoea and pressure on the blood vessels may produce headache, vertigo, engorgement of the jugular and edema of the face. As a result of either toxicosis or pressure, nearly every patient will describe sensations about the head, varying in graphic force with his powers of expression. Pressure on the recurrent nerve may cause paralysis of the laryngeal muscles. The resultant hoarseness is rarely permanent, as only one nerve is affected, and the laryngeal muscles in time accommodate themselves to compensate for the injury. Dysphagia is not common, nor is pain often a symptom of goitre, coming late even in malignant degeneration.

Tremor, especially of the fingers, is almost as characteristic, if not quite as constant, as any of the foregoing symptoms. It may vary considerably in degree. There is a fine rhythmic movement with from eight to ten vibrations to the second.

"Nervousness" is an early and frequent complaint. Too often it is passed by with pity or contempt. Irritability, excitability, restlessness and insomnia, parasthesia, vertigo and faintness, mental fatigue and loss of memory, depression, apprehension and morbid fears, are common mental states. Fortunately less common are hallucinations, confusion of ideas, delirum and suicidal or homicidal mania.

Alimentary disturbances are common, due to functional and degenerative changes the result of toxemia. The occurrence in spite of a good appetite of rapid emaciation is as peculiar here as in diabetes. Abdominal criscis may occur simulating those of tabes. A diarrhea is seen

in about one-third of the cases, due to subacidity of the gastric contents.

Body weight may be lost from ten to thirty or even sixty pounds in a short while. It may be regained almost as rapidly. The skin is warm, moist and relaxed. The patient complains of a sensation of subjective warmth. Sweating is profuse to a characteristic degree. Vaso-motor instability is shown in mottling of the skin. Pigmentation of the skin is common. Fever is present in the severe acute cases, and, according to Stern, is even more common in the mild types.

The pathological changes in the thyroid gland and the clinical course of exophthalmic goitre closely parallel each other. Rogers describes the course of the disease in four stages, as follows:

First—In the incipent stage, the patient may notice fatigue too readily induced. Loss of appetite, insomnia, irritability and slight dyspnoea may ensue. If tachycardia appears the disease is progressing. Throughout this early stage are seen symptoms of a vague but distinct coupling of the emotions and the central nervous system, the heart and vaso-motor apparatus, the digestive and muscular systems. All alike seem to feel the whip of insidious toxins stinging their several systems into feverish activity, sapping stamina and disorganizing orderly co-operation. The picture is strikingly suggestive of the intoxication of a chronic infection such as tuberculosis, or a more dangerous pitfall yet, these vague complaints might be classed as neurasthenic.

If the disease remains untreated it usually progresses to the second stage of distinct hyperthyroidism. Plummer states that on an average patients appear at the Mayo

clinic for treatment three years after the first evidence of intoxication. This stage is apt to show one, two, or all of the classical triad: tachycardia, exophthalmos and goitre, and it is at this time that the picture is most typical.

The third stage is that of chronic exophthalmic goitre. When the disease has lasted a long time, and particularly after treatment has been applied, the gland may harden and the vascular phenomena diminish. The symptoms can be demonstrated at once, however, by any excitment. Remissions of greater or less duration are quite characteristic, and there is a tendency to relapse or exacerbations. It is in this chronic stage that both exophthalmos and goitre are likely to be pronounced. The various psychoses are then more apt to appear.

Coincident with the atrophic and degenerative changes in the thyroid, the typical case progresses to the final or myxedematous stage. With the goitre of the same size or enlarging, the weakness is progressive, the skin becomes pale and shows increased puffiness about the eyes and face, with dense edema of the lower extremeties, mental torpor, slow pulse and anemia.

The diagnosis of exophthalmic goitre is often difficult in the early stages, but this is the period the disease should be recognized, as treatment is then much more efficient than later. The name of the disease is misleading, as frequently the eyes are not prominent and the thyroid is not appreciably enlarged. Tachycardia is the most constant symptom, and when it persists without obvious cause, such as hysteria, cardiac disease, tobacco, whisky or drug addiction, hyperthyroidism should be suspected; and a postive diagnosis is justified if either goitre or exophthal-

mos is found to co-exist. The presence of tremor, sweating, muscular weakness, nervous excitability, digestive disturbances, emaciation and characteristic blood changes leave no question as to the nature of the disease. Not looking is a more frequent source of error in the diagnosis than not knowing.

The symptoms of hyperthyroidism are increased by excitement or exertion. The tendency to remissions or exacerbations must be borne in mind. At one observation the patient may have an enlarged, pulsating goitre, prominent eyes and rapid pulse; and at another the gland may be smaller, the eyes nearly normal and the pulse comparatively slow and regular. This fact is believed to be due to thyroid secretion accumulating in the gland until, from some apparent or unknown cause, it suddenly throws its contents into the circulation.

The differential diagnosis of hyperthyroidism from hysteria is sometimes difficult. In both diseases the patient often dates the onset from some mental or physical shock. In both there are tachycardia, nervousness and muscular weakness, and in both there is often some difficulty in swallowing, caused by the goitre in the one case and the globus hysterica in the other.

Early tuberculosis may closely simulate hyperthyroidism. Tachycardia, slight fever, nervousness, emaciation and weakness are common to both. In incipient tuberculosis the patient is usually in good spirits, while thyroid intoxication, as a rule, causes despondency Physical examination of the chest and X-ray picture should serve to distinguish the two in most cases. The therapeutic test of the administration of thyroid extract over a short

period may be useful, for if hyperthroidism exists the symptoms are made worse.

Despite the low mortality as now reported in the hands of numerous surgeons, a patient should not be treated surgically until medical measures have been tried and proved inefficient, as from one-fourth to one-half of all patients suffering with exophthalmic goitre will get well without operation. Whether their recovery is due to the remedies prescribed by the physician or the inherent tendency of the system to overcome an abnormality, is not a material question. The practical fact is that these patients should be treated along accepted lines and given reasonable time to see what nature will do for them, before they are subjected to surgical risk. If, however, they fail to improve or their symptoms get worse, then an operation should be advised before complications develop or incurable structural changes take place in the heart, eyes and other organs. In other words, the surgeon should not operate on a case too soon, and the physician should not treat a case too long.

The medical treatment of hyperthyroidism consists primarily in rest. If possible the patient should be placed in a hospital for a time and confined to bed. An ice bag over the heart is often of temporary benefit. Various drugs have been advocated by different authorities, but no two seem able to get the same results in either experimental or clinical work. All agree that iodine and thyroid extract should not be employed. As myxedema and exophthalmic goitre are the antithesis one of the other, one of the earliest treatments consisted in injecting the serum of the blood of a patient suffering with myxedema into the circulation of the victim of hyperthyroidism. Some

temporary good resulted. The next effort in this direction was the use of a serum called antithyroidin, obtained from the blood of a thyroidectomized sheep. Theoretically, the blood of an animal whose thyroid had been removed should contain the toxin which would combine with and neutralize thyroglobulin; but the remedy failed to prove of therapeutic value. Several years ago a cytolytic and antitoxic serum was introduced by Rogers and Beebe. The reputation of the originators and the good results reported by those who first used it encouraged the profession to hope that a specific for the disease had at last been found. This expectation has not been realized. In a recent personal communication, Dr. Rogers states that he regards the serum as very valuable in the treatment of toxemic patients, but it is merely an adjuvant for helping out a small number of cases. He regards as the rational treatment of hyperthyroidal disturbances the ligation of arteries or the extirpation of limited foci of disease, which, by pressure upon the sound parts of the gland, may interfere with nutrition of the organ.

While as yet serum therapy has been unsuccessful, the work of men like Rogers and Beebe will eventually triumph. The day will come when some specific of animal origin will be discovered that will act as beneficially in exophthalmic goitre as thyroid extract does in myxedema.

Electricity, that mysterious agent which has promised so much and accomplished so little in the treatment of various diseases, has, of course, been tried for hyperthyriodism. Faradism has a few advocates. Galvanism, especially in the form of electrolysis and cataphoresis, has been extensively employed. The X-ray seemed at one

time to have established a place for itself. Beck reports good results in the treatment of small goitres. Mayo still uses it in certain cases as preliminary to operation, claiming it produces sclerosis of the gland. Von Eiselsberg, Deaver and others after extensive trial, say it has postively no beneficial effect.

Injections into the gland of alcohol, iodine carbolic acid and iodoform emulsion have been tried and abandoned. Abbey has used radium and reports good results. Porter has published a number of cases markedly improved by the injection of boiling water, the technique being the same as that employed by Wyeth in the treatment of angioma. This treatment causes a coagulation of the blood and acts on the principle of a ligation operation. There would seem to be little to commend it.

Statistics showing the results of non-operative treatment are meager. White followed up the histories of 102 cases admitted to Guy's Hospital between 1888 and 1907. In White's series 60 per cent recovered, 20 per cent were improved, 5 per cent had not done well, and 15 per cent had died.

The surgical treatment of hyperthyroidism owes its conception to the accidental observation that patients operated on to relieve them of the mechanical or pressure symptoms of goitre, were also cured of their toxic symptoms, such as tachycardia, tremor, nervous irritability, muscular weakness and loss of weight.

The development of the surgical treatment is largely due to the work of Theodor Kocher of Berne, Switzerland. A generation ago the operation of thyroidectomy was considered one of the most dangerous in surgery. Kocher's mortality in his first seventy cases of simple

goitre was 40 per cent; Charles H. Mayo's mortality in his first sixteen cases of exophthalmic goitre was 25 per cent. It is no wonder that at one time the operation was regarded by the majority of the surgeons as unwarranted, and it is not surprising that there are still today, some among the older practitioners who hesitate to advise a patient with goitre to seek operative relief except as a last resort. Times have changed, however, and the operation has been rendered comparatively simple and safe in experienced hands. Kocher with a courage that seemed marvelous to the present generation of surgeons, persisted in his work until he finally established a technique that has reduced the mortality in his last one thousand cases of goitre to three-tenths of one per cent. This was accomplished by:

1. Early operations on more favorable cases.
2. Improved aseptic methods to prevent infection.
3. Better methods of anesthesia.
4. An exposure which gave ability to control hemorrhage and avoid injury to certain structures of the neck.

All operations have for their object the diminution of thyroid secretion. This is accomplished in one or two ways: either by lessening the amount of the blood going to the gland by ligation of one or more of the principal arteries, or by reducing the amount of secreting structure by excision of part of the gland. Crile thinks in both ligation and excision the benefit results not only from lessening the blood supply and diminishing the secreting structure, but also from cutting off the nerve supply.

Ligations are indicated in very mild cases where this operation may be all that is necessary to effect a cure; and in very bad cases as a preliminary to a more radical

operation when the condition of the patient improves sufficiently to make it safe.

The operation of excision usually consists in the removal of one lobe and the isthmus. The difficult and important question that confronts the surgeon in every case is how much thyroid tissue he should take out. If he removes too little, the symptoms of hyperthyroidism continue; if he removes too much, the symptoms of hypothyroidism develop. Rogers has impressed the fact that operations which give brilliant immediate results are often followed by remote difficulties and complications. A compensatory hyperthrophy of the remaining lobe may develop with persistence of exophthalmic goitre symptoms, or degenerative changes may take place in the tissue left, with the development of myxedema. Until we know more, surgery should not be too radical. If an error is made, it had better be on the side of conservatism, as it is easy to take out more, but impossible to put back any, of the tissue which has such an important effect on the physical nutrition and nervous equilibrium of the individual.

Mayo states that the thyroid gland has a "factor of safety" of six; in other words, that one-sixth of the gland can carry on its work. The removal of one lobe and the isthmus means the excision of about three-fifths of the gland, and this is the common practice of most surgeons.

The dangers attending the operation of partial thyriodectomy were formerly discussed under numerous heads. Infection, hemorrhage and shock have been so minimized by modern methods that they are not more likely to occur than during other major operations. Injury to the

recurrent largyngeal nerve can be avoided by care in ligating the inferior thyroid artery, and is an accident less frequent than cutting the ureter in hysterectomy. Tetany can be prevented by leaving the posterior capsule of the gland, thus assuring the preservation of the parathyroids. Myxedema can be guarded against by leaving enough active thyroid tissue to carry on the function of the gland.

The danger of the anesthetic has been much discussed. Kocher, Tinker, and others operate almost exclusively with local anesthesia, and attribute their low mortality largely to its use. Mayo, Ochsner and others use a general anesthetic and get just as good results.

The one and only special danger in the surgical treatment of exophthalmic goitre is acute hyperthyroidism. When this condition develops the symptoms come on shortly after the patient is removed from the table, and consist in rapid pulse, high fever, great restlessness, and often wild delirium. Acute hyperthyriodism after an operation was formerly thought to be due to squeezing the gland and the absorption of its juices by the raw surfaces of the wound. This theory has been discredited on the ground that the thyroid in exophthalmic goitre has been repeatedly and thoroughly massaged by osteopaths without producing marked increase in the symptoms. Kocher as a routine measure crushes a zone of the gland with a heavy forcep prior to its ligation and division, and no increase of hyperthyroidism has been noted. A number of surgeons who at one time cauterized the wound or painted it with Harrington's solution, to prevent absorption, have now abandoned the practice because it did no good.

Crile believes that acute hyperthyroidism after an operation is due to excessive secretion of the gland caused by psychic and traumatic stimuli. The psychic factor is excitement and fear. This may be independent of mechanical injury to the thyroid as shown by the fact that the symptoms often develop in susceptible patients after operations on other parts of the body. The method used by Crile to eliminate this factor is to inspire the patient with confidence and keep him in ignorance of the time of operation.

The traumatic factor consists in the impulses that pass from the field of operation to the central nervous system. Crile claims that a general anesthetic does not prevent injurious impulses reaching the brain and causing exhaustion and shock. The use of a local anesthetic, however, temporarily disconnects the part being operated on from the brain. He therefore, cocainizes the field of operation as thoroughly as if no general anesthetic were employed. With these two precautions, he states, ligation or excision may be done in desperate cases without fear of acute hyperthyroidism. The method is very valuable in certain cases, but it is too elaborate and time-consuming to be adopted as a routine practice by many surgeons in all cases.

When a patient with exophthalmic goitre comes to a surgeon, the case ought to be kept under observation and carefully studied for some days before deciding on the character of the operation best suited to the individual, and the safest time to perform it. Tinker impresses the fact that an examination of a patient who has been kept at rest for some days may give an erroneous impression of the safety of the operation. On the other hand, a patient

coming from a distance, fatigued and frightened, may give the impression of a worse operative risk than is really the case.

Mayo states that the operation for exophthalmic goitre is not one of emergency, nor is it to be called life-saving in extreme cases, and it should not be undertaken except at a proper time. He calls attention to the exacerbations and remissions in the intensity of the symptoms, which he attributes to the accumulation and discharge of toxic substances in the gland. He believes that if the patient is carefully watched, these periods can be predicted, and the most favorable time for the operation is not when the patient's symptoms are at the best, but shortly after the gland has dumped its load and before it again becomes laden with toxic material.

Some cases can safely be operated on after one or two day's study; others require weeks of rest and medical treatment preliminary to the operation. Some cases require ligation of one or more arteries before it is safe to excise a portion of the gland; other cases should have one lobe and the isthmus removed without preliminary ligation. Tinker describes a desperate case which was saved by a graduated operation divided into five separate stages at intervals varying from a few days to several weeks.

Surgery of the thyroid is still in its developmental stage. In reading the literature one is impressed by the fact that each author, at one time, attributed his good results to some special feature of his operation which he has since found unnecessary or injurious and has abandoned. Fads are fast disappearing, and the work is rapidly ap-

proaching the practice of basic principles underlying established surgery.

In the hands of men like Mayo, Kocher, Ochsner, Crile, Tinker and others, the mortality of operations for hyperthyroidism is now from two to five per cent, and 85 per cent of those who recover may be said to be symptomatic cures. It is neither honest nor expedient, however, to make light of the operation or to belittle its difficulties and dangers. The figures quoted are from the statistics of master surgeons, and by no means represent the results of the average operator.

After a successful operation for hyperthyroidism, the improvement in the patient is immediate and marked. In fact, no operation in surgery produces such quick and brilliant results. Tremor disappears, the pulse falls to normal, the eyes become less wild, and restlessness and irritability are replaced by quiet and composure. The wound, as a rule, heals rapidly, and the patient is able to leave the hospital in from ten to fourteen days.

Because the patient is well from the operation, and because the acute symptoms are relieved, is not ground for immediate return to the ordinary activities of life. Crile very properly states that it requires approximately the same time to recover from exophthalmic goitre as from a nervous breakdown from other causes. A successful operation should be followed by an adequate rest cure.

The Diagnosis and Treatment of Hypothyroidism.*

The thyroid gland is in many respects the most won-
derful organ of the body. Through its internal secretion
it influences the physical development of the child, and
the psychic condition and mental activity of the adult.
It regulates the growth of bone, the formation and dis-
tribution of fat, and the nutrition of the skin, teeth, hair
and nails. It plays an important part in menstruation
and parturition, and has much to do with sexual desire
and power. It influences the rate of heart beat, the char-
acter of the peripheral circulation, and hence markedly
affects the general blood pressure. It presides over the
nitrogenous metabolism of the body and in other known,
and perhaps unsuspected ways, plays an important
part in the human economy.

Many theories have been advanced to explain the pro-
tean action of thyroid secretion, but at this time it is
impossible to say which is the true one. Either as a neu-
tralizer of endogenous toxins, or as a hormone stimulat-
ing other organs and tissues to activity, or by some other
obscure but potent influence, it is the pace maker for the
body. Thyroid secretion seems to act as the gasoline for
the human automobile. If the lever controlling its supply
is advanced then the engine races, the gears grind and the
whole machine throbs and vibrates. If the lever is re-

tarded then the engine knocks, the pistons hang, and the halting machinery momentarily threatens to come to a standstill.

If thyroid secretion is excessive there are symptoms of metabolic riot. Heat production and gaseous interchange are rapid. The body tissues are stimulated to a course of wasting dissipation. There are seen tremor, sweating, tachycardia, muscular weakness, loss of weight and feverish mental activity.

If thyroid secretion is deficient the metabolism of the body is depressed and heat production and gaseous interchange are at a low ebb. In the young, growth is lessened and the skeletal system is dwarfed. Connective tissue cells remain myxomatous. The skin is dry and thick and the hair is coarse and shows deficient nourishment. The nervous system halts in development and mentality does not rise above the level of the infant.

My interest in the thyroid gland was first attracted by the cases of exopthalmic goitre that came to me for surgical treatment. The symptoms in the advanced type of this disease were so dramatic and the results of operations directed to reducing the supply of thyroid secretion to the system so immediate and remarkable that I was tremendously impressed with the important role the thyroid gland played in the physiology of the human organism.

The study of hyperthyroidism as seen in exopthalmic goitre naturally led me to the study of hypothyroidism as seen in myxedema, and the increasing number of cases coming under my observation where the symptoms were demonstrated to be due to excess of thyroid activity led me to wonder if there were not an equal number of

patients who suffered from symptoms due to deficient thyroid secretion.

Any diagnostician will of course recognize at once a fully developed case of exopthalmic goitre with its staring eyes, bulging throat, tachycardia, tremor, sweating, nervous irritability and loss of weight, or a marked case of infantile myxedema such as has been so graphically described by Osler. The stunted statue and squat figure; the blubber lips, sunken nose, lolling tongue and half closed eyes, the expressionless face, thick skin and coarse hair make a picture that cannot be mistaken.

But there are other cases where the symptoms due to perverted thyroid secretion are not so clear and well defined, and cases of mild hyperthyroidism have often been treated for hysteria or neurasthenia, and cases of mild hypothyroidism have often been treated for anemia or malaria.

Surgeons in recent years have learned to be constantly on the watch for symptoms of hyperthyroidism and many cases of the disease are diagnosticated and treated in the incipient stage, but physicians as a rule have not yet been trained to the same vigilance in the detection of the early symptoms of hypothyroidism, a condition of equal frequency and importance and one much more easily treated.

From observation and study I am satisfied there are a large number of patients who suffer from thyroid poverty and who drift from physician to physician without the cause of their symptoms being suspected.

A proper diagnosis in this class of cases must be based on a thorough knowledge of the physiological action of the thyroid gland and a study of the symptoms that follow its perverted function. In doubtful cases thyroid extract

may be given in small doses as a therapeutic test, and continued if it does good and discontinued if it does harm.

Thyroid extract should never be given in cases of heart lesion, albuminuria or glycosuria. In other cases if it produces dizziness, intoxication or cardiac disturbances it need not be discontinued at once as the untoward symptoms can be relieved by the administration of Fowler's solution of arsenic. The dose of thyroid extract should be a small one, not over two grains three times a day and the common mistake should not be made in acting on the belief that if a little is good more will be better. A small dose long continued is safer and more efficient than a large dose given for a short time. It must also be remembered that many of the thyroid preparations on the market are absolutely inert and the physician should either prescribe a standardized tablet made by a reliable manufacturer or else activate the tablet of unknown efficiency by combining with it several grains of iodide of soda.

Thyroid extract has been recommended as almost a specific in a long list of diseases, but the indiscriminate use of the drug is to be condemned, as large doses are dangerous and small doses frequently repeated may permanently impair the patient's health. It is a poison and should never be prescribed unless the case is kept under observation while it is being administered.

I would like to report a number of cases suffering from widely varying symptoms that I have treated and relieved by the use of thyroid extract, but the time at my disposal for the preparation of this paper has been too limited to allow me to look up their histories and records. I must

content myself, therefore, in being suggestive rather than explicit and simply state that I have personally found the substitution thyroid treatment of unquestioned benefit in selected cases embraced in the following heads:

1. Cretinism.
2. Myxedema (spontaneous and post-operative).
3. Parenchymatous goitre—especially in girls about the age of puberty.
4. Amenorrhoea and chlorosis.
5. Absence or failure of sexual desire or power.
6. Obesity.
7. Eczema of the dry or scaly type.
8. Delayed union of fractures.
9. Certain neuropathic conditions where the patient is apathetic and drowsy with slow pulse and cold skin.

The Influence of the General Condition of the Patient on the Result of a Surgical Operation *

There are some operations, such as for the relief of a strangulated hernia or the removal of a gangrenous appendix, which are so urgently demanded for the immediate purpose of saving life, that the surgeon has no choice, and nothing is considered but the one great need. These are imperative operations, and must be done regardless of risk. There are other operations, such as for the correction of deformities or the relief of some chronic ailment, which, however desirable, are not essential to the life of the patient. These are elective operations, and should not be undertaken without carefully considering the danger to be incurred on the one hand and the benefit to be hoped for on the other.

In estimating the risk of an operation, the modern surgeon is too apt to base his opinion on the statistics contained in text-books and encyclopediæ. Figures are proverbially unreliable. Thus, for instance, the statistics of old operations, such as ligations and amputations, are usually a record of pre-antiseptic surgery, and do not represent the work of today; while the statistics of more recent operations, such as thyroidectomy or gastroenterostomy, are usually the record of master-workmen like Kocher and the Mayos, and do not represent the

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* Read at a meeting of the Rochester Surgical Club, Rochester, Minn., August, 1907.

danger of these operations in the hands of the average surgeon.

In deciding whether or not to advise a patient to undergo an elective operation, the following factors should be considered:

First, the gravity of the operation and the relief to be expected from its successful issue. There is no operation devoid of risk, and some are attended by great danger. Patients are occasionally unreasonable, and insist on having a serious operation done to rid themselves of a more or less fancied ailment. Unless the operation is safe and there is a reasonable assurance of the patient being materially benefited, he should not be subjected to an elective surgical ordeal.

Second, the ability and experience of the operator. No courageous doctor should fail to undertake an operation if the patient's condition is urgent, if delay means death, and if no more experienced surgeon is available. Competency is a relative term, and the man on the ground should endeavor to afford relief, or else he fails to measure up to his responsibility. It is different, however, when the disease is a chronic one, and the patient could be safely moved to a hospital, or await the arrival of a surgeon from a neighboring city. A patient is entitled to the best possible prospect for prolonged life or restored health that his resources permit. No conscientious surgeon should undertake an operation without asking himself whether he has the skill to do the work satisfactorily. In many cases he can honestly answer the question in the affirmative. In some cases, while there may be a doubt in his mind, he is justified in operating by the fact that the patient has not the phy-

sical strength to bear transportation, or the financial means to bring a surgeon from a distance. In other cases, however, the surgeon must recognize his inferiority to other men in the profession who devote their lives to special lines of work, and when the patient has the physical and the pecuniary power to secure their services it is his duty to place the case in their hands. This obligation is so universally recognized that the sacrifice it entails is not often appreciated by the laity, and sometimes not by the class of the profession which is benefited.

Third, the general condition of the patient, or the consideration of the personal factors in the individual case which influence the result of the operation. It is often said—sometimes seriously, sometimes satirically and sometimes truly—that the operation was a success, but the patient died. In such a case the indications for the operation may have been plain, but the contraindications were either overlooked or disregarded. The operation may have completely corrected the condition from which the patient suffered; it may have been perfect in its technique and brilliant in its execution, but the patient may have lost his life from some complication which could have been foreseen by more careful preliminary investigation. Many surgeons have had uncontrollable hemorrhage to follow the removal of a small tumor, owing to the patient having hemophilia, or have had gangrene develop in a wound, owing to the existence of diabetes, or have had suppression of urine to follow, owing to the presence of nephritis.

Sir James Paget, in one of his classical lectures, says: "Never decide upon an operation, even of trivial kind, without first examining the patient as to the risk of his

life. You should examine him with at least as much care as you would for life insurance. It is surely at least as important that a man should not die or suffer serious damage after an operation, as that his life should be safely insured for a few hundred pounds."

Two separate and independent examinations should be made of every surgical patient—the first for the purpose of diagnosis and the determination of the condition to be corrected; and the second for the purpose of prognosis, or the determination of the safety of the operation. In forming an estimate of the latter many factors have to be taken into consideration, such as age, sex, race, habits of life, constitutional diseases and visceral disorders. In discussing these under separate headings much use has been made of an article by Sir Frederick Treves, who acknowledges a similar indebtedness to the writings of Sir James Paget.

Age. As a general proposition it may be stated that patients at either extreme of life are poor subjects for surgery.

Children under five years of age take anesthetics badly, often suffer severe shock from only moderate loss of blood, and are difficult to manage during convalescence. They are liable to gastro-intestinal disturbances, especially in hot weather, and frequently are the victims of chicken-pox, measles, or other infectious diseases to which they are susceptible. On the other hand, owing to the energetic cell activity of the period of growth, their tissues heal rapidly and are not prone to suppuration. In operating on children avoid, if possible, the period of first dentition, as they are liable to digestive disturbances and to convulsions, and apt to develop a high temperature

from slight provocation. Use chloroform as an anesthetic, and avoid the infliction of long-continued pain. Especial care should be taken to prevent loss of blood or body heat. Dressings should be carefully watched and changed as often as soiled. Usually no attempt should be made to keep the child in bed, but, from the first, it should be permitted to lie on the mother's lap or be carried about in her arms.

The period from the fifth to the fifteenth year is the golden age of surgery. Hence the mortality is least and the results best from operations of almost every kind. This is due to the fact that metabolic processes are active and resistance to infection vigorous; that the various organs of the body are normal and perform their functions satisfactory; that the nervous system is stable and uninfluenced by regrets for the past or fears for the future; and finally, that the reason and will of the patient have developed sufficiently for the surgeon to secure their acquiescence and co-operation.

Between the twentieth and fortieth years the mortality of operations greatly increases. This is due to sexual development, attended by the possibility of excesses, abnormalities and diseases; also, to the cares and responsibilities of maturity, often leading to neurasthenia from excessive work and worry. And finally there may be superadded the injurious results of addiction to tobacco, whiskey or other drugs, and of other forms of dissipation.

In patients past forty years of age the mortality from operations is nearly three times as great as in patients under twenty. As a rule, old people are severely shocked by loss of blood or body heat; their wounds heal

slowly, and their tissues have little power to resist infection. They are head-strong and rebellious, and intolerant to confinement. Their organs of assimilation and excretion are impaired, and their stomachs and kidneys liable to break down. Taken all in all, old age is a greater bar to surgery than any other complication, unless it be chronic alcoholism. It must be remembered, however, that senility is not measured in years. Surgically speaking, a man is as old as his arteries. In impressing this point Sir James Paget says: "They that are fat and bloated, flabby of texture, torpid, wheezy, and incapable of exercises, looking older than their years, are very bad.

"They that are fat, florid and plethoric, firm skinned, and with good muscular power, clear-headed, and willing to work like younger men, are not, indeed, good subjects for operation, but they are scarcely bad.

"The old people that are thin and dry and tough, clear-voiced and bright-eyed, with good stomachs and strong wills, muscular and active, are not bad; they bear all but the largest operations very well."

The brilliant results of Young and others in operating on old men for prostatic enlargement show that modern surgery, with its short period of anesthesia, diminished loss of blood, freedom from infection, and provisions for adequate drainage, has made it safe to do operations on the aged which, only a short time ago would have been unjustifiable.

Sex. Other things being equal, women bear operations better than men. This is due to the fact that they are designed for maternity and are naturally endowed with more passive endurance; that they are more con-

fiding and trustful and place greater confidence in the assurances of the surgeon; that they are more tolerant to confinement to bed, because they are not accustomed to active out-door life; and finally, they are more temperate and regular in their lives, and not as frequently the victims of excesses in food and drink.

On the other hand, menstruation, pregnancy, lactation and the phenomena of the menopause give to the sex the possibility of complications to which the male is not subject. As a rule, operations should be avoided during menstruation, as the period is frequently attended with nervous and digestive disturbances. The time of election, especially in gynecological work, is the two weeks midway between the completion of one period and the beginning of the next. In emergencies, however, an operation may be done during menstruation without misgivings, as usually no ill effects result.

It is also undesirable to do an operation of election during pregnancy, as it entails the possibility of miscarriage and of kidney break-down. The danger is more theoretical than real, however, as hundreds of abdominal sections have been done on pregnant women, for appendicitis and other abdominal diseases without interference with gestation.

It is also inadvisable to operate during lactation, because the woman's strength and resistance are below par, and if she continues to nurse the child she will have an undue tax upon her; while if she ceases to do so, there will be the danger of trouble with her breast.

Race. The influence of race on the result of an operation is a question of interest, but not of great practical value. It is stated that a Chinaman makes the best

patient on earth. In America, especially in the Southern States, there is good opportunity to contrast the respective resistence of the Caucasian and the Negro. Surgeons of large experience in operating on both races are practically unanimous in the opinion that the black man is a better subject than the white man. This does not apply to the mulatto, for he follows the rule of the mongrel, and has the vices of both parents and the virtues of neither. It is obvious even in the life of an individual that the pure negro is losing the immunity formerly enjoyed to certain diseases, and is developing predispositions which render him a less favorable subject for operation. Before the Civil War insanity was almost unknown in the race; tuberculosis was not common, and venereal diseases of rare occurrence. With education and syphilization he is now the victim of various nervous disorders; with unhygienic surroundings and scant clothing he is a frequent victim of the Great White Plague, and with improper food, eaten at irregular intervals, his digestion has become impaired, and he is suffering more and more frequently from gall-stones, appendicitis, and diseases of the kidneys. The day will come when the degeneration of the whole race will have reached a point to make it an accepted fact that they are poor subjects for surgical work.

Vigor and Weakness.—Paradoxical as it may sound, the strong, robust man frequently does not make as good a surgical patient as one who is feeble and wasted by disease. He may have huge limbs and mighty strength; he may never have had an illness in his life, and boast the constitution of an ox, but he is a poor subject for the surgeon's knife. He is accustomed to fresh air and an

active life; his blood vessels are full and oxygenation of the tissues is rapid. His food has been large in quantity and gross in quality. When misfortune overtakes him there is no time to accommodate himself to new conditions, and the whole habit of his life is suddenly changed. To this is added the shock of his accident, the horror of an operation, and the dread of the future. Just the contrary is true with the chronic invalid, who has been acclimated to bed life by long weeks of invalidism, whose circulation, respiration, and digestion have become adjusted to his condition, and who has been brought to view the approaching operation as a means of relief and pain and restoration to health. Of the two types described the last will be well first.

Obesity.—As a rule, a fat patient is a bad patient. If the obesity is hereditary and the general health good, it is not as bad as when the fat is due to gluttony, indolence, or beer-drinking. An obese patient is an elephant on your hands. He usually breathes with difficulty and cannot assume a recumbent position. It is hard to move him in bed, and difficult to prevent the formation of bed-sores. The skin is usually thin from pressure, and its edges difficult to approximate. The subcutaneous fat has little vitality and readily breaks down and liquefies. Infection once taking place, pus burrows far and wide, and is drained with great difficulty. Sometimes such patients die suddenly from fat embolism; again, they become exhausted and prove an easy victim to intercurrent diseases. If recovery takes place, convalescence is always tedious and prolonged.

Alcoholism.—The most unpromising patient who ever comes to a surgeon is the chronic alcoholic. Constant

drinkers who are never drunk, and yet who are never sober, are worse subjects than those who get on periodic sprees. The gravity of the risk in the individual case will depend on the length of time the individual has taken stimulant; the average amount consumed daily; the presence or absence of tremor of the hand or alteration of the knee-jerk; the existence of gastritis, as indicated by anorexia, nausea or vomiting; and the condition of the liver, kidneys, heart, and blood vessels. No operation except the most imperative should be done on the alcoholic, because of the danger of administration of the anesthetic, because of the depraved condition of the tissues and consequent lack of resistance to infection, because of the liability of the kidneys to stall or the heart to run away, and because of the danger of the development of wild and uncontrollable delirium. When an operation is unavoidable, but not immediately necessary, the patient should be prepared for it by diminishing or withdrawing the stimulant. When an immediate operation is necessary, it is better to continue the alcohol until the period of greatest danger is passed.

Affections of the Nervous System.—Hysterical patients usually give a great deal of trouble before the operation, but do very well after the ordeal is over. A nervous woman who wishes to tell of the surgical adventures of her friends, who desires to discuss every step and detail of her own operation and tell how she wishes her case managed, and who is possessed of exaggerated fears as to the complications which may develop or the ultimate result which may follow, usually, after the operation, becomes a model patient. Her imagination enters upon

fresh fields and she becomes hopeful and courageous, and at once begins to plan a new life of activity.

The neurasthentic, however, is a different subject, and woe betide the incautious surgeon who operates on one. Occasionally neurasthenia may be due to chronic appendicitis, uterine displacement, or some other cause which can be corrected and the patient cured. But in a large majority of cases the neurasthenia is due to a disturbance of the general body nutrition, and no operation will prove of benefit. The victim of neurasthenia wears out the patience of his family and friends, and in order to secure a sympathetic listener, and in order to demonstrate to the community the serious nature of his disease, he goes from surgeon to surgeon and from hospital to hospital, offering himself as a bloody sacrifice to his curious form of egotism, and glorying in his martyrdom. Surgery does this class of patients no good, but deepens, rather than relieves, the neurasthenia.

The insane are usually good subjects for surgical operation. The regular life of an asylum is conducive to good health, and the absence of mental anxiety on the part of the patient is a favorable factor. Mayo, who has done a great deal of work on this class of cases, states that they are entitled to just the same surgical treatment as the sane—no more, no less. In other words, insane people should be operated on to relieve them of hernia, gall-stones, and abdominal tumors, but hernia, gall-stones, and abdominal tumors should not be operated on to cure the patient of insanity.

Syphilis does not usually increase the risk of a surgical operation. Wounds made during the full bloom of the secondary stage heal kindly, and operations done on ter-

tiary lesions usually do well. The danger in operating in the early stages of syphilis is rather one to the surgeon than to the patient, as the blood is infectious.

Gout has no effect upon the result of an operation, unless it has existed sufficiently long to produce cardiac or renal changes. It is, of course, not wise to operate during an acute attack of the disease, and it must also be remembered that an operation sometimes precipitates an attack in a person predisposed to the disease.

Hemophilia contraindicates a surgical operation, unless urgent and required to save life. Fortunately, the subjects of hemophilia do not always bleed. A case is in mind where a man was brought to the hospital with gangrenous appendicitis, and who gave a history of having suffered repeatedly from almost fatal hemorrhage after trivial injuries. After consultation a section was determined on as the only hope for life. It was performed with less than the usual loss of blood.

Anemia, or a deficiency of either hemoglobin or red blood cells, is often a contraindication to an operation. Mikulicz states that a hemoglobin percentage below 30, or a red blood count below 3,500,000 should postpone operative intervention until the blood is enriched by medical treatment. While this is a safe rule to follow, it has its exceptions. The lives of women have often been saved by hysterectomies, whose blood findings were below this minimum, owing to profuse and uncontrollable uterine hemorrhage.

Malaria and an injury or operation have a reciprocal relation one with the other. Malaria may cause pain, hemorrage or inflammatory changes at the site of injury, which assumes an intermittent type and yield to adminis-

tration of quinine. Again, an injury or operation inflicted on a person the victim of malaria may markedly aggravate the disease, or induce a fresh onset of ague; or again, it will make active symptoms in a person who is not known to be infected.

Diabetes is a contraindication to an operation of election. The tissues of a diabetic patient possess little power of regeneration, and have so little resistance to infection that inflammation, suppuration, and gangrene are almost certain to develop. Surgery on diabetics should only be done when most imperatively demanded, as often, when the sugar in the urine has been decreased to an insignificant amount by weeks of dietetic treatment, it will reappear in large quantities immediately after the operation, and the patient die in diabetic coma.

Cardiac Disease.—Valvular disease of the heart is believed by the laity and by most of the profession to add greatly to the risk of the anesthetic and to the danger of death from complications following the operation. This does not seem substantiated by facts. Many thousands of patients with valvular heart disease are operated upon every year, and it is exceedingly rare that any bad effect is produced; and but a very small proportion of the patients who die from chloroform or ether are found to have been the victim of organic heart disease. So far as convalescence after the operation is concerned, patients with heart trouble are usually markedly improved by the enforced rest and confinement to bed. A dilated or fatty heart is much more to be feared than one with valvular lesion, especially if there is adequate compensation.

Renal Diseases.—It was formerly thought that the presence of albumen or casts in the urine indicated grave

organic change in the kidney, and was a bar to surgery. This may have been the case with the crude tests of the older pathologists, but it is certainly not so today, for the modern laboratory man finds albumen and casts in a great proportion of the specimens submitted to him. Dr. Osler has emphasized this in a recent article entitled, "The Advantages of Having a Few Casts in the Urine After a Man Reaches Sixty Years of Age." Certain forms of nephritis, however, add greatly to the danger of an operation, and all surgeons occasionally lose patients from suppression of urine followed by uremic convulsions. No operation of election should be done on a patient suffering with advanced Bright's, and when the urgency of the case is such that an operation has to be done, the patient should be carefully prepared by dietetic and eliminative treatment before the operation, and the kidneys kept active afterwards by the use of spartine and the administration of large quantities of water by mouth or rectum.

Respiratory Tract.—Bronchitis, pneumonitis, and phthisis pulmonalis are serious bars to surgery, inasmuch as they make the administration of the anesthetic difficult and dangerous, and complicate the after-treatment by coughing, embarrased breathing, and imperfect oxygenation. In acute inflammation of the lungs operations should be postponed, and in chronic trouble they should not be done except to meet real indications.

Alimentary Tract.—Gastric dyspepsia, intestinal indigestion, diarrhea, and constipation are all conditions to be corrected prior to an operation. The prognosis is bad when, to the toxins of disease, is added the poison produced by putrefaction of gastric and intestinal contents.

In correcting the conditions named food should be sterilized, the mouth should be repeatedly disinfected, the stomach should be properly irrigated, and intestinal antiseptics, together with purgatives, should be judiciously administered.

In disease of the liver, especially when the patient is jaundiced, the danger of hemorrhage should be determined by testing the coagulability of the blood, and, except in cases of great urgency, operations should be postponed until the cholemia subsides, or until, by the administration of calcium chloride or other remedies, the danger of uncontrollable bleeding can be removed.

Surgical Shock [*]

It has long been known that patients who met with accidents or underwent operations, not of themselves necessarily fatal, frequently died without apparent cause. It is only within the last century that it has been known that these cases died of shock. As soon as the condition was recognized it was studied both clinically and experimentally by the leading men of the profession, and the literature of the subject is now large.

The writers of the past generation had a clear conception of the causes and symptoms of shock, but they did not understand its nature, and hence the methods of prevention and cure were inefficient and unscientific. Within the past decade Crile, of Cleveland, a leader in the new school of surgical physiology, has done much to work out its pathology, and the publication of his recent articles has revolutionized the practice of the profession in dealing with the condition. There are yet some apparently contradictory facts to be explained and certain problems to be more fully elucidated, and, consequently, it will probably be best to introduce the subject by giving a clinical picture of a typical case.

Typical Case.

A patient who has been subjected to a mutilating and perhaps bloody, operation is carried to the ward. When placed in bed he makes no effort to move or speak, but

[*] Lecture reprinted from the Bulletin of the University College of Medicine, August, 1908.

lies staring at the attendants. His face is white and pallid, his features pinched, and his eyes are sunken in their sockets and encircled by black discoloration. He complains of no pain, expresses no anxiety, and his mental attitude is one of complete indifference. His skin is cold and bathed in a clammy sweat. His lips and nails are blue, his pulse is rapid and thread-like, or may be imperceptible at the wrist. His respiration is shallow, sighing and irregular. A thermometer placed in the rectum shows his temperature to be subnormal. There is no muscular paralysis, but the patient lies perfectly still and is disinclined to move. There is no unconsciousness, but he does not speak unless spoken to, and then answers questions in slow monosyllables. If reaction does not follow, the pulse gets weaker and finally disappears; the respiration becomes more shallow, and the skin clammy and colder, and "this momentary pause in the act of death is soon followed by the grim reality." A post mortem examination shows no pathologic change to explain the symptoms.

Causes of Shock.

Loss of Blood.—This is by far the most frequent cause of shock. In fact, a sudden hemorrhage produces symptoms so identical with shock that it is difficult to distinguish the two. The more rapid the loss of blood the more severe the shock, and the less the chance of recovery.

Loss of Heat.—The abstraction of body heat by operating in a cold room, exposing the abdominal or other viscera to the air, or wetting the clothing of the patient with

solutions which, while warm at the time, soon become cold, all strongly tend to produce shock.

Loss of Time.—An operation which, if quickly done, would produce no appreciable degree of shock, if unduly prolonged, frequently is followed by alarming symptoms. This is partially due to the fatigue, exposure, and prolonged anesthesia to which the patient is subjected, but is also due to the continued irritation of the brain and spinal cord by stimuli from the field of operation. Ether and chloroform prevent the appreciation of pain, but they do not protect the nerve centers whose exhaustion causes shock.

Mechanical Injuries.—These vary in degree from rough-handling of tissues by the surgeon to a compound dislocation or crushing injury of a limb by an accident. The various tissues and organs of the body have a shock-producing power in proportion to their nerve supply, and, consequently, the degree of shock will depend not only on the severity of the trauma, but also on the sensory innervation of the part. Injuries to certain regions of the body are especially likely to be followed by shock, such as a blow on the testicle, in the pit of the stomach, or at the angle of the jaw.

Burns.—The action of intense heat on the nerve terminals of the skin often produces profound shock. Mummery has pointed out that burns of the first and second degree produce more shock than burns of the third degree. This is due to the fact that, in the first case, the nerve terminals are exposed and irritated, whereas, in the second, they are destroyed. A burn involving more than one-half of the surface of the body usually causes death from shock.

Perforating Injuries.—Rupture of the gall bladder, perforation of a gastric, duodenal or typhoid ulcer, or a rapidly fulminating case of appendicitis, resulting in the discharge of irritating fluids into the peritoneal cavity, frequently causes sudden and profound shock. It is supposed that the pus, gastric juices, or intestinal contents act on the peritoneum as heat would act on the skin.

Mental Emotions.—The psychic condition of the patient undoubtedly influences the occurrence of shock. There is no reason to doubt that violent emotions, such as intense fear or terror, can exhaust the nervous power and produce the same results as a physical injury. A case is on record where a man who had been sentenced to death by bleeding actually died on hearing water trickle into a basin, which he supposed to be blood issuing from his veins. Another case is quoted where a man fainted and died, under the impression that an operation was in progress when the surgeon was, in fact, only tracing with his nail the line of incision on his perineum. Brunton quotes the case of a janitor of a college who had rendered himself obnoxious to the students. One night they carried him to a lonely place, and having dressed themselves in black, tried him for his life. He at first affected to treat the incindent as a joke, but was assured by the students that they meant it in real earnest. He was found guilty and was told to prepare himself for death. He was blind-folded and made to kneel before a block, and was struck on the back of the neck with a wet towel. He fell to the ground, and, to the astonishment and horror of the students, they found that he was dead.

In addition to the foregoing exciting causes of shock there is considerable influence exerted on its production

by the age, sex, temperament, mental condition, and general health of the individual. The young and the old are more likely to suffer from shock than those of middle years. Women, as a rule, stand injuries and operations better than men. Those of sanguine or nervous temperament suffer more from shock than the lymphatic. The chronic invalid usually stands surgery better than a robust man, and a patient who comes to the operating table confident and hopeful is less likely to develop shock than one possessed with gloomy forebodings as to the future.

PATHOLOGY OF SHOCK.

Shock is stated by Crile to be due essentially to an abnormally low blood pressure. The normal blood pressure is dependent on three factors: First, a proper force of heart beat; second, a proper rate of heart beat; and third, a proper peripheral resistance. The effect of variation of these factors may be stated in several definite laws:

1. The blood pressure must vary with the *rate* of the heart, if the heart strength and peripheral resistance remain constant.

2. The blood pressure must vary with the *strength* of the heart, if the heart rate and peripheral resistance remain constant.

3. The blood pressure must vary with *peripheral resistance,* if the heart strength and heart rate remain constant.

4. The blood pressure may be normal if one or two factors increase, while one or two factors decrease.

5. If all three factors increase, we must have a proportionate increase in blood pressure.

6. If all decrease, we must have a proportionate decrease in blood pressure.

7. All three factors are controlled by the nervous system.

Shock is due to irritating or painful impulses which are produced by accidents or operations. These impulses act on the centers of the brain and cord, first causing stimulation, but later resulting in exhaustion or paralysis. They may be of such degree as at once to overwhelm the centers, or they may produce the same result slowly, by acting continuously for a considerable period of time. Crile believes that shock is invariably due to paralysis of the vaso-motor centers and a consequent loss of peripheral resistance. Howell believes that it may also be due to feeble heart action. Accepting the latter conclusion, as seems borne out by clinical facts, shock may be defined as a condition characterized by long continued low blood pressure, due either to partial or complete paralysis of the vaso-constrictor centers and consequent lack of peripheral resistance (vascular shock), or to alterations in the rate and force of the heart beat, due to partial or complete loss of activity of the cardio-inhibitory center (cardiac shock).

Whether the low blood pressure be due to vascular or cardiac causes, the result is the same. The face becomes blanched, the skin pallid, the temperature subnormal, the pulse weak and thread-like, the respiration shallow and sighing, the muscular power impaired, and cerebration blunted. These changes are due to lack of sufficient circulation to maintain normal physiological function. The blood does not flow freely through the arterial system, but accumulates in the dilated venous trunks, especially

in the abdominal region. In other words, the arterial system bleeds into the dilated venous system, and, as the old writers put it, the patient may bleed to death into his own vessels.

Symptoms of Shock.

Facial.—The expression of the face is frequently so altered that it is difficult to recognize the individual. The pupils are but slightly changed, but the eyes are sunken in their sockets, the lids half closed, and the areolar around them darkened. The nose is small and shriveled, and the lips are thin, pale, and usually parted.

Cutaneous.—The skin has a sickly pallor, and the surface of the body is cold and bathed in clammy sweat. The fingers and nails are of a bluish color, and the skin on the palmar aspect of the hands lies in loose folds.

Mental.—The patient is not unconscious, but the mental faculties are less acute than normal. He complains of no pain, expresses no anxiety as to his future, and shows no interest in what is being done for him. If asked a question, he will reply intelligently, but slowly and with effort.

Muscular.—There is no paralysis, but reflexes are diminished, and the voluntary and involuntary muscular systems are greatly relaxed. The patient lies in the posture in which he is put, and does not voluntarily change his position or move his limbs. There is frequently loss of control of the sphincters, with involuntary discharge of urine and feces.

Respiratory.—Respirations are, as a rule, quickened, irregular, and shallow. In grave cases there is gasping

although air hunger is never as marked as in pure hemorrhage.

Circulatory.—The condition of the pulse varies with the degree of shock. It is usually small, thread-like, and at times imperceptible. The strength of the pulse is an important guide to the surgeon in making a prognosis.

Temperature.—The temperature is subnormal, a thermometer placed in the rectum frequently registering as low as 95° or 96° F. Much lower temperatures are reported from observations taken in the axilla, but these are not reliable.

TERMINATIONS.

Shock may terminate in either of two ways:

Reaction.—If recovery ensues, the patient begins to move about in bed, turns on his side, and perhaps vomits. The pulse gets fuller and slower; the respiration deeper and more regular; the skin warmer and dryer, until finally there is a return of the system to its normal condition.

Death.—In fatal cases of shock, the pulse grows weaker and finally disappears. Respiration becomes shallow and irregular. The skin grows colder; the patient gradually becomes unconscious; the sphincters relax, and he slowly expires.

DIAGNOSIS OF SHOCK.

The diagnosis of shock, at the present time, cannot be made with scientific accuracy, and must be based on the personal experience of the surgeon. It is made on the symptoms above described, especially the weak, rapid pulse, the cold, pallid skin, the subnormal temperature and the curious condition of the mental faculties.

The differential diagnosis between traumatic shock and hemorrhage, syncope, fat embolism, hysteria, and other conditions with which it may be confused, is sometimes difficult. In hemorrhage, the symptoms are usually gradual in onset and progressive. The patient often faints, recovers, and faints again; and is usually restless, tossing from side to side in bed, and expressing great anxiety about his condition. In syncope there is usually preliminary nausea, ringing in the ears and dizziness, and when the actual attack ensues the patient becomes completely unconscious. In fat embolism, the symptoms usually develop twenty-four to forty-eight hours after the injury, when there is sudden pallor, irregular heart action, difficult breathing, and perhaps convulsions. This occurs chiefly after fractures or operations on bone. Fat will be found in the urine. In hysteria there are usually the characteristic stigmata of the disease, the temperature remains normal, and careful observation will usually detect a flaw in the symptom complex.

PROGNOSIS OF SHOCK.

This depends on the degree of the injury, the severity of the symptoms, the general condition of the patient, and the presence or absence of complications like septic infection. Shock may prove instantly fatal, as in death from a blow over the solar plexus; or the patient may live one or two days and finally die; or recovery may take place when hope has been practically abandoned. Shock, the result of profuse hemorrhage, is more dangerous than shock from other causes.

TREATMENT OF SHOCK.

While much difference exists among surgeons as to the treatment of shock when it develops there is great unanimity of opinion as to the necessity of using certain measures to prevent its occurrence. Shock is rarely seen in a hospital where well-conducted operations are skillfully performed on properly prepared patients. The call for curative treatment of shock is now principally seen in cases injured in railway accidents or other catastrophes.

PREVENTIVE TREATMENT.

1. *Avoid fright* by gaining the patient's confidence, inspiring him with hope, and sending him to the operating room in good mental condition. If the operation be one of election, the surgeon should be absolutely frank in discussing the dangers of the proceedure at the time the patient is considering whether or not to have it done. If, however, it is decided to do the operation, the surgeon should no longer refer to the possibility of disaster or death, but should become optimistic and dwell on the relief and benefits to be expected. If, at the time of the operation, the patient is nervous, it is often wise to give a hypodermic of morphine. In the case of a child, when possible, it is well to fix the hour of the operation so that the anesthetic may be begun while the patient is asleep.

Sometimes an adult is met with who is so panic-stricken at the thought of an operation that it may be necessary to adopt the following method suggested by Crile, which, of course, should only be carried out with the full consent of near relatives or friends: The sur-

geon tells the patient on his admission to the hospital that he does not know whether or not it will be necessary to operate on him, and that he will only undertake the case with the distinct agreement that he is to do whatever he thinks best. The consent of the patient having been obtained, he is subjected to considerable preliminary examination, and finally told that he will be given the "inhalation treatment." An anaesthetizer goes to the bed at a certain hour each day, places a mask over his face and lets him inhale alcohol, disguised with some aromatic agent. At the same hour on the day set for the operation the alcohol is given as usual, with the slow addition of an anesthetic, until unconsciousness is produced and the patient can be transported to the operating room. This expedient has, in Crile's opinion, enabled him to save several lives which would otherwise have been lost.

2. *Avoid loss of blood* during the operation by the use of Esmarch's bandages and constictors in amputations, by angulation of the table in work on the head and neck, and by carefully and quickly catching and tying all bleeding vessels. Bloodgood says that a long bloodless operation is less likely to produce shock than a short bloody one.

3. *Avoid loss of heat* by operating in a warm room, keeping exposed viscera and raw surfaces protected with hot moist towels, and seeing that the patient does not become wet with solutions. It is also wise not to have the patient in actual contact with the surface of a glass or iron table, but to interpose some non-conductor, if not actually to put him on a hot-water pad.

4. *Avoid loss of time,* not by breathless haste, which

might lead to imperfect work, but by having a distinct plan of the operation in mind and executing its various steps speedily. Occasionally, in extremely difficult and tedious operations, requiring more than an hour for their execution, it is well, if circumstances permit, to do part of the work one day and complete it one or two days later. Victor Horsley advocates this being regularly done in cerebral surgery, trephining and exposing the dura one day, and subsequently dividing it and doing the work in the brain structure.

5. *Avoid bruising and tearing tissue,* roughly handling or pulling on viscera. Dissection should not be made bluntly, and all manipulations should be gently carried out. The fact that the patient is under an anaesthetic and his sensory centers unable to appreciate pain does not mean that his vaso-motor and cardiac centers are equally protected and he cannot develop shock.

6. *Avoid division of large nerves,* especially in weak patients, until these have been blocked by the intra-neural injection of cocaine. Crile says: "As no impulses of any kind can pass either upward or downward, there is no more shock in dividing tissues—even the nerve trunks themselves, thus blocked—than in dividing the sleeve of the patient's coat." In operations on the lower extremity and pelvis this principle can be more extensively applied by injecting the cocaine into the spinal canal at or near the fourth lumbar vertebra.

CURATIVE TREATMENT.

When shock is actually present, active treatment is of little use, and in using remedies the surgeon should be careful that, if he do no good, at least he do no harm.

Senn says that it is as important to know what not to do as to know what to do, and Warren emphasizes the fact that it should be clearly remembered that the condition is one of exhaustion, and rest is needed for repair. As the symptoms of shock are those of profound weakness and prostration, it was long a practice to give stimulants, such as alcohol, digitalis or strychnine. According to the modern pathology, which is undoubtedly correct, these remedies do harm. The centers are already partly or completely paralyzed from over-stimulation, and the administration of strychnine, according to Mummery, "is like beating a tired horse—it may call forth an effort if we beat hard enough, but it hastens the end." Or, to quote Crile, "It would be just as logical to treat strychnine poisoning with traumatic shock as to treat traumatic shock with strychnine."

The only rational remedy would be one which would act not on the centers, but on the dilated vessels, restoring the peripheral resistance. Unfortunately, we have no satisfactory means to accomplish this end. The following is a brief description of the present accepted mode of treatment:

1. *Secure physiological rest* by placing the patient in a quiet room, excluding all friends and relatives, and giving a moderate dose of morphine. The surgeon and attendants should be calm and confident in their manner, and the patient should not be allowed to infer that his condition is unusual or alarming.

2. *Apply external heat* by placing the patient between warm blankets, putting hot-water bags to the feet, thighs, and body, and in some cases injecting hot fluids into the rectum.

3. *Support the circulation mechanically* by posture, by bandaging, or by the pneumatic suit. In mild cases of shock all that may be necessary is to lower the head, thus gravitating the blood to the anemic brain. In graver cases the limbs should be enveloped in elastic, non-absorbent cotton, and firmly bandaged from extremity to body. A compress may also be applied over the abdomen. Crile's pneumatic suit is an appliance by which the entire surface of the body is subjected to pressure by compressed air. Unfortunately, however, it is rarely at hand when needed.

4. *Transfusion with warm saline solution* by rectum, beneath the skin, or into a vein. In cases of shock due to hemorrhage this is the most logical and efficient method of treatment. In cases of shock from other causes, however, it is not so valuable. The average individual can only take up about two quarts of the solution. After this amount has been given an interval must elapse, and then only two or three ounces given at a time. If this precaution is disregarded, fatal complications may ensue from edema of the pulmonary or abdominal regions.

5. *The administration of adrenalin chloride,* which is usually effected by combining it with the saline solution used in transfusion, one drachm of the 1-1000 commercial solution being added to one quart of normal salt solution and introduced slowly, but continuously, the rate regulated by the character of the symptoms or the record of a sphygmomanometer.

QUESTION OF OPERATING DURING SHOCK.

In accident cases the surgeon is confronted with the question whether to operate at once or wait for reaction;

whether he had better add the shock of an operation to the shock of the injury, with danger of death of the patient, or whether he had better wait, hoping for improvement, but possibly sacrificing the patient's only chance for life. There is no rule, although most authorities advise waiting, unless the mutilation causes great pain, or unless hemorrhage is actually in existence. On the other hand, Wainwright says: "To remove the nerve impulses after trauma an immediate repair of injury is very important. Leaving a mangled, oozing limb, with crushed and exposed nerves, with the hope that it will give more favorable opportunity for intervention, will, in many cases, by allowing the cause continually to act, only drive the patient into a condition beyond all hope."

Sulphate of Spartine in Surgical Practice *

Like most surgeons, I devote little time to the study of the therapeutic action of drugs. Patients who are referred to me have usually exhausted the resources of materia medica, and in my practice I rarely have occasion to employ medicinal agents other than the well-known anæsthetics, antiseptics, purgatives and tonics. I believe, however, I have accidentally discovered in sulphate of spartine a valuable remedy for the prevention and treatment of post-operative suppression of urine.

I do not know whether or not my experience coincides with that of other surgeons, but it is a fact that in the last five years I have lost more cases from post-operative suppression of urine than from all other causes combined, and this despite the almost routine use of chlroform as an anæsthetic.

The cases have usually been those with pre-existing nephritis from sepsis or cholemia. Shock has not apparently been a factor, for the condition would not develop for twenty-four or thirty-six hours. A patient operated upon for retention of urine, or for jaundice due to obstruction of the common duct, would do well for one or two days, and just as he was thought to be out of danger, there would come the news that he was passing no urine. He would become restless, then listless, would develop a stupor which would rapidly deepen

into coma, and would die with all the symptoms characteristic of uremia. In the treatment of this condition I tried water by mouth, under the skin and in the rectum; hot packs and vapor baths; cups and counter-irritants; strychnine, digitalis and nitro-glycerin; calomel and saline purgatives; and in one case stripping the kidney capsules, with uniformly bad results.

Two years ago I began empirically the use of sulphate of spartine, and now I have the record of six cases in which I am sure the drug was the means of saving the patient's life.

I will not occupy the time of the Association by reading a dissertation on spartine which I would, of course, have to copy from a text book. Its therapeutic effect is to increase the blood pressure, make the pulse slower and stronger, and act as a powerful diuretic. Its action is manifest in thirty minutes after administration and lasts for four to six hours.

I believe the reason why the value of sulphate of spartine is not more widely recognized is because authorities advise its use in doses so small as to be worthless. To get results, it must be given hypodermatically in doses of from one to two grains, repeated every three to six hours. When so employed, I have repeatedly seen it pull up a run-a-way heart and set in motion a pair of stalled kidneys. Its use should not be delayed until suppression of urine is already in existence, but it should be prescribed as a prophylactic as well as a curative agent.

I do not mean to claim that it is specific, or that it should be employed to the exclusion of other measures, such as purgatives, transfusions and hot packs. I do

believe, however, from actual experience, that it is preferable to the drugs of the digitalis type in rapidity of action, ease of administration, and, what is more important—results.

The After Care of a Surgical Patient *

When the operation is concluded, the dressings applied, and the gown, if soiled or wet, changed, the patient is ready to be taken to his room. To accomplish this would seem a simple procedure, yet from the lack of definite plan it is often the occasion of much confusion and delay. The litter consists of a light frame of metal tubing resting on a rolling carriage. The frame is short enough to fit lengthwise in the patient's bed. The litter is covered with a warm dry blanket. It is rolled up beside the operating table. Two assistants on the opposite side of the table now lift the patient vertically upward while two others slip the frame beneath him. The blanket worn around the limbs during the operation is now removed and the blanket on the litter wrapped about him. The frame is put back on the carriage and the patient quickly rolled to his room. The frame is put on the bed, the patient lifted up and the frame slipped out. The transfer is complete and there has been no pulling or hauling, which might slip a ligature or disarrange the dressings. Some one must now sit with the patient until the effects of the anesthetic have worn off and reaction has taken place.

Shock is rarely seen in an alarming degree after operations on properly prepared patients, planned and executed so as to avoid unnecessary loss of heat, blood and time.

It is frequently seen, however, in accident cases especially if there has been hemorrhage or mutilation.

The operating room is not the place to treat shock. Only in rare cases should intravenous or subcutaneous transfusion be practiced while the patient is on the table. The unavoidable delay in the operation, the danger of infection and the manipulations of unskilled assistants which attend the procedure, render it more productive of harm than of good. All that should usually be done is to give a hypodermic of a small dose of morphine and bend every energy to the rapid completion of the operative work and the early removal of the case from the table. The patient should be put to bed between warm blankets. Additional heat should also be applied by means of hot water bags, due precautions being observed to prevent accidental burns. The foot of the bed should be elevated to gravitate blood to the anemic brain. The half empty blood vessels should be filled by the introduction into the system of as much normal saline solution as it will take up. This can best be effected by low pressure continuous rectal injection. By this method many quarts of fluid can be introduced without discomfort or traumatism.

While the use of small doses of morphine has a decided effect for good, the confidence formerly placed in strychnine seems misplaced. If shock is due to paralysis of the vaso-motor system then stimulation of the exhausted centers will result in more harm than good. Of all drugs employed to produce re-action the solution of chloride of adrenalin seems the most logical. As its effect is evanescent the dose must be repeated at frequent intervals. In addition to the measures recommended it is of the

utmost importance to exclude all relatives from the room, thus removing injurious excitement. The patient should not be encouraged by hysterical reassurance, but made to feel that everything is being done for him by the quiet self confidence exhibited in the deportment of the doctor and nurses.

Pain.—The first, and to the patient, the most important symptom after an operation to demand prompt and adequate treatment is pain. It is often a difficult question for the surgeon to decide how much the patient really suffers, and what measures are really demanded. Some patients make a great outcry when really they are more scared than hurt, and the pain will do them less harm than the drug which brings relief. Again, other patients invested with a sort of old fashioned doctrine of predestination will make no complaint, and it is only by seeing the set face, the compressed lips and clinched hands and noting the cold and clammy skin, that a knowledge is derived of the necessity for giving an opiate. When pain is moderate the patient should be encouraged to bear it, but when it is excessive the patient should be relieved by the hypodermic use of morphine. The bromides and coal tar preparations are worse than useless. Morphine in small, and if necessary repeated doses, is what is demanded. It is true the drug may mask symptoms, cause nausea and produce constipation, but it is the lesser horn of the dilemma. In the old days morphine was first abused, and then not used. Even now some well known authorities decry its employment. The majority of modern surgeons, however, believe that when administered judiciously it not only brings temporary relief, but frequently saves life.

Nausea.—Another frequent and distressing symptom from which the patient suffers after an operation is nausea and vomiting, primarily due to the anesthetic, but sometimes continued by sepsis and the presence of blood and bile in the stomach. When the patient retches on the operating table, and it is evident there is fluid in the stomach, then much after distress will be avoided if the stomach contents are washed out before he is taken to his room. This procedure is a routine practice with some surgeons, but is not necessary or advisable in all cases. When nausea and vomiting continue it is at first treated tentatively by putting ice cloths to the forehead and throat, applying a mustard plaster to the pit of the stomach, and giving cracked ice or a few sips of water. If the symptoms are unrelieved the patient is given two glasses of tepid water. It is always taken with relish. If retained it reestablishes peristalsis in the proper direction, and if rejected it washes out the stomach contents almost as effectually as could be done by lavage. Drugs, such as creosote, oxalate of cerium, ingluvin, bismuth, hydrocyanic acid, etc., have been found useless, and effervescent drinks such as ginger ale and champagne are injurious. In the vast majority of cases the nausea will cease spontaneously as soon as the chloroform or ether is eliminated from the blood. Time is the only panacea and unless symptoms of danger are evident the less that is done by the surgeon the sooner the patient will experience relief.

In a few cases the vomiting, instead of getting better, gets worse. At first the patient strains violently and ejects a clear or yellow fluid. Later without muscular effort there is the constant regurgitation of a green or

black fluid. There is little or no nausea, but at frequent intervals the patient gives a little gulp and spits out a mouthful of what is popularly supposed to be bile. A chemical examination will show that it is not bile but blood. The pathology of this condition is a disputed question, but it is generally believed that a low grade of septicemia has so weakened the gastric blood vessels as to permit the hemorrhagic transudation. The practical fact is that if these patients are let alone most of them will die. The introduction of a stomach tube will show the presence of a quart or more of black fluid in the stomach. What is spit up is merely the overflow. If the material remains in the stomach the patient may die from exhaustion. If the material passes into the intestines the patient may die from toxemia. The prompt use of the stomach tube at the first symptom of black vomit, the emptying of the viscus and the irrigation of its cavity with normal saline or a weak adrenalin solution gives the only chance for life.

Position in Bed.—In the early days of abdominal surgery patients were kept on their backs and not allowed to turn on the side for the first seven days. It was found, however, that in addition to the suffering entailed there was an increase in the liability to complications. After an ovariotomy or hysterectomy it is well to keep the patient in one position for the first twenty-four hours to lessen the danger of a ligature slipping, but in operations like appendicitis the patient should be encouraged to lie first on one side and then on the other. In cases of operations on the stomach or where there is a vaginal drain, the patient should be put in an exaggerated Fowler's position in order to carry fluids in the desired direction

by gravity. Some surgeons go so far as to put all laparotomies in a sitting position from the first, claiming not only better drainage, but increased freedom of respiration from the removal of the pressure of the liver on the diaphragm. The position of the patient in bed is one of the essential features of the Fowler-Murphy method of treating cases of diffuse peritonitis, hence hospitals should have facilities and nurses experience, to enable them to handle such cases.

Bladder and Kidneys.—During the first few days after an operation the bladder and kidneys require careful watching to see that they properly perform their functions. If the patient does not voluntarily pass urine he should be urged to make every effort to do so. A catheter should not be employed if it is possible to avoid it, as its use always entails some danger of infection, and makes the patient more or less dependent on it in future. Sometimes, however, it has to be employed to prevent undue distention of the bladder. The quantity of urine should be carefully recorded and if any abnormality is noted a specimen should be sent to the laboratory for examination.

In cases of chronic interstitial nephritis and in cases of acute septicemia and cholemia there is often sudden suppression of urine which may result in death. After operations on patients with jaundice more cases die from uremia than from any other one cause. At St. Luke's Hospital the old treatment of transfusion, sweating, cups over the kidneys, administration of infusion of digitalis, etc., has given very poor results. Recently a new line has been followed, and while the number of cases is yet too few to justify an unqualified statement, still it is believed that a distinct improvement has been made. As

soon as any inadequacy of kidney activity is noted sulphate of spartine is given hypodermically in one to two
grain doses; repeated according to effects at four or six
hour intervals. In six cases where there was complete
suppression there has been prompt response to the drug,
with ultimate recovery.

Bowels.—When peritonitis, either local or general, was
more the rule than the exception after abdominal sections, it was the practice to give calomel in large doses
as soon as the stomach would retain it. In fact the surgeon was not happy until the patient was freely purged.

That early purgation is a prophylactic against inflammatory conditions is undeniably true, but that it depletes
the patient, retards recovery, and is not necessary under
modern methods has been proved to the satisfaction of
most operators. In a case which runs smoothly, in other
words when the abdomen is not distended and the pulse
and temperature are practically normal, there is no hurry
to purge. Usually a soap suds enema is given 36 or 48
hours after the operation and the bowels afterwards regulated if necessary by the administration of some mild
laxative such as cascara or senna. Occasionally, however, symptoms quickly develop which forbode evil, and
then broken doses of calomel should be at once prescribed.
Should the drug be rejected, or fail to act, it should be
followed by enemata. When the abdomen becomes
swollen and tympanitic the administration of purgatives
by the mouth should be withheld. The bowels are paralytic from distention, and stimulation is ineffective and
harmful. In this condition enemata are the sole reliance.
Many authorities recommend high injections through a
long rectal tube, but this method has not given the results

that were claimed for it. In the hands of the average nurse the tube simply coils up in the rectum, and the surgeon himself usually fails in his efforts to pass it through the sigmoid flexure. Fortunately the elevation of the hips on pillows and the slow injection into the rectum with an ordinary syringe gives about as good results, and does not entail as much manipulation or cause as much discomfort. The formula of the enemata used varies, the most common combination consisting of glycerine, turpentine, sulphate of magnesia and water. Hardon, of Atlanta, is enthusiastic in advocating a mixture of one ounce of powdered alum to one quart of water, and at St. Luke's Hospital human bile is sometimes used with good effect. This is only possible when a case of gall-bladder drainage is in the house to supply the needed material. For the past ten years efforts have been made by many experimenters to find a drug which would produce purgation when administered hypodermically, but so far without success. If such an agent is ever discovered it will prove one of the most valuable additions that could be made to our present resources.

Water.—As an empty stomach is one of the best safeguards against vomiting, water should be withheld from a patient for several hours after recovery from anesthesia. If at the end of this time no nausea exists it may be given in small quantities at half hour intervals, and if it be well borne by the stomach the quantity increased until thirst is relieved. The water may be acidulated with lemon juice, or cold or hot tea without sweetening substituted for it. Should vomiting prevent the patient from retaining fluid, thirst may be relieved by allowing the patient to rinse out the mouth with water to get the taste,

and injecting a pint of saline solution in the rectum to produce the effect.

Nourishment.—If the patient is very weak nutritive enemata may be used from the first. In employing this method of feeding it must be remembered that while the rectum can absorb it cannot digest, hence nutriment must be in an assimilable form. As good a mixture as any other consists of two ounces of Peptonoids or Predigested Beef and four ounces of saline solution. If deemed necessary one ounce of whiskey may be added. Nutritive enemata should not be given oftener than every six hours, and the rectum should be irrigated once daily to remove resi- duum or other irritating material. The average patient does not require any nourishment for the first twenty- four or thirty-six hours. In fact many may safely and advantageously be allowed to go without food for two or three days. Dr. Tanner has taught the profession that starvation is not an immediate danger. The case, whose death is attributed to exhaustion, usually dies of some form of sepsis.

The first nourishment given a patient by mouth should be liquid, easily digested and not likely to cause gas in the stomach and intestines. Egg albumen, chicken broth, beef tea and buttermilk fulfill these conditions. After the third day, if everything is going well, soft boiled eggs, milk toast and other semi-solid articles of diet may be added. At the end of the first week the patient may be allowed the ordinary hospital bill of fare.

Tonics.—But little medicine as a rule is given in a sur- gical hospital. If the patient's appetite flags a table- spoonful of whiskey before meals or a glass of wine or beer with meals is usually more productive of results

than distasteful drugs. If the patient feels he is being neglected he should be given tincture of nux vomica or some harmless placebo, with which the market is well supplied.

General Hygiene.—The efficiency of the modern trained nurse leaves but little for the surgeon to suggest in regard to changing bed linen, giving baths, rubbing the back, etc. If there is one point occasionally neglected it is the toilet of the mouth. The proper use of the tooth brush and the employment of antiseptic washes will not only add to the patient's comfort, but prevent fermentation of food by the reduction in the number of bacteria taken into the digestive tract.

Length of Confinement to Bed.—It is of course impossible to have any hard and fast rule as to how long it is necessary to keep a patient in bed after an operation. Each case must be considered on its special indications. A prudent patient may be allowed to sit up sooner than a reckless one. A lean individual will secure a firm cicatrix quicker than a fat one. A wound that unites by primary intention does not necessitate the same length of confinment as one that suppurates. Still there ought to be some consensus of opinion among surgeons of experience as to how long an uncomplicated abdominal case should retain the recumbent position. Unfortunately the beginner who consults literature for the answer to this question will find the expression of very different views. Some surgeons put their appendicitis cases up on the seventh day and send them home on the ninth. Others keep them in bed three or four weeks and discharge them, with many injunctions as to prudence, a week or ten days later. The tendency is to make the

patient's stay in the hospital shorter and shorter. This is partly due to improved results, but also influenced by a desire to advertise the surgeon, to make the patient more willing to consent to an operation, to increase the number of cases cared for by a ward of limited capacity, and finally to lessen the money paid to the hospital so there may be more left for professional services. Between too great conservatism on the one hand, with the attendant loss of time and money, and too great radicalism on the other, with the danger of hernia and other complications, there must eventually be derived the happy mean. At present the average surgeon keeps an appendicitis case in bed about two weeks and discharges him in three. An operation necessitating greater weakening of the abdominal wall such as a hysterectomy confines the patient to bed three weeks and to the hospital four. Experience has proved that incisions in the upper abdomen, for liver and stomach work, do not entail the same liability to hernia as openings in the lower abdomen for pelvic tumors, hence the time in bed after the former may safely be less than after the latter. The use of abdominal belts after operations is not advisable unless the abdomen is pendulous, or in cases where the cicatrix is weak owing to the employment of drainage. This last indication for the use of an irksome prophylactic measure has been materially lessened by the present practice of inserting drains, when needed, through stab incisions and closing the operative wound as if no drain had been employed.

The After Care of Wounds.—Clean wounds, without drainage, need not usually be dressed until the eighth or ninth day, when the stitches are removed and a second

dressing applied. The three indications for an earlier dressing are pain, fever, or saturation of dressings with wound secretion. Should the wound be uncomfortable when there is no rise of temperature it is probably due to stiffening of the dressings with blood or serum, and redressing will give immediate relief. Should there be a tight stitch with a read area about it, it should be clipped or removed as soon as discovered in order to prevent the formation of an abcess.

Past, Present and Future of Cancer *

Cancer has been a constant subject of study in all ages and in all nations; but the mystery of its origin has yet been unsolved, resistance to its progress has yet proved unsuccessful, and the symbolic crab continues to sink its claws slowly but relentlessly into the flesh of its victim. The disease, at first local, becomes regional and constitutional, recurring when removed, disseminating when left; undergoing degeneration, intractable ulceration, deep spreading excavation, and is usually followed by cachexia and death.

It is the object of this paper to review the history of cancer, to call attention to the recent views of the etiology of the disease, to state the present accepted principles of its treatment, and to suggest the possible developments of the future—a scope admittedly too broad to be properly covered in the time at the writer's disposal for preparation, or of the Society's programme for reading.

HISTORY AND ETIOLOGY OF CANCER.

The earliest medical writings contained descriptions of tumors, and their origin was attributed to the influence of malign or evil spirits. Hippocrates taught that the body was composed of four humors—blood, phlegm, black bile and yellow bile; and Galen believed that tumors resulted from the accumulation of one of these humors. Harvey, by the discovery of the circulation of the blood,

overturned preconceived views of pathology, and the blood was next regarded as the source of disease, and its organization the origin of tumor formation. Boerhaave, some years later, ascribed tumors to the newly discovered lymph, the vitiated or degenerated variety being supposed to produce cancer. Hunter was the first to recognize the similarity in structure between tumors and normal tissues, and to maintain that they originated by a modification of formative processes. Broussais, early in the nineteenth century, claimed that all tumors, including cancer, were forms of chronic inflammation consequent on organic irritation. This view, owing to its simplicity and comprehensiveness, at once became accepted, but its supremacy was short-lived. Schleiden, with the aid of the then recently-perfected microscope, discovered the cellular structure of plants. Schwann demonstrated the analogy in animals; Muller established the fact that tumors were formed of cells, but believed the cells were derived from the blood. Virchow accepted the cellular structure of tumors, but denied the blastodermal origin of the cells. He proved that cells could not develop *de novo,* but followed biological laws, and were always the result of the division of pre-existing cells. He believed in metaplasia, and taught that a given cell under some conditions might become an epithelial cell, and, under other conditions, a connective tissue cell. Cohnheim controverted the existence of metaplasia, and established the law of the legitimate succession of cells. He classified tumors by referring each to the embryonic layer, from which its cell had origin, and advanced a novel and ingenious theory to explain their development. He claimed that during the progress of cell differentiation in the embryo

more cells were produced at a certain point than were necessary for the formation of that particular region. He believed that these left-over cells—not utilized by the growth of the organism—were arrested in their further development and remained in a dormant condition. He claimed that if the energy of these detached and slumbering islets of embryonal cells were reawakened later by internal or external stimulation, they would undergo rapid proliferation and form a tumor, whose histologic type and clinical behavior would depend on the epiblastic, mesoblastic, or hypoblastic source of the parent cells. The physiologic analogue of this hypothetic pathologic process is seen in the changes which occur in the human body at the age of puberty, when cells that have slept for years with latent energy are re-awakened, and, multiplying rapidly, produce the development of the sexual organs and the other changes characteristic of that period.

Based on Cohnheim's theory, which is almost universally accepted, the term tumor is now used in a much more restricted sense than formerly. At one time the word was employed to designate all kinds of swellings; now a sharp line of separation is drawn between tumors supposed to be the result of the proliferation of embryonal cells occurring independently of microbic cause, and inflammatory swellings demonstrated to be the result of the proliferation of mature cells produced by the action of pathogenic organisms.

Bacteriologists have accepted this division, but have patiently and persistently endeavored to prove that many of the growths supposed to be tumors or neoplasms, due to the proliferation of embryonal cells, were really in-

flammatory swellings, due to the action of hitherto un-known but recently-discovered micro-organisms.

In the past few years lupus, syphilis, leprosy, tuber-culosis, actinomycocis, and other diseases have been proved either by direct demonstration or by argument from analogy, to be due to a germ, and one by one have been transferred from the slowly diminishing list of tu-mors to the gradually increasing list of infective gran-ulomata. At this time a vigorous and well-directed effort is being made to prove that cancer is due to a parasite, but the claim is resisted by the adherents of the cellular theory of the origin of the growth. Two papers read a few months ago at the same meeting of the American Medical Association, one by Dr. Nicholas Senn, of Chi-cago, and the other by Dr. Rosewell Park, of Buffalo, ably and forcibly present the two sides of the question.

Senn, perhaps, the greatest surgical philosopher of the day, presents his views with citations of authorities so voluminous that while the article will remain as a per-manent encyclopedia of reference to the literature of the subject, it is almost impossible to make an abstract of it that does justice to the author. Senn adheres to the cellular theory of the origin of cancer and claims that from an etiologic standpoint very little has been added to our knowledge of the disease since the epoch-making labors of Virchow, Cohnheim, and Waldeyer. He says that after the demonstration of the fact that all inflam-matory processes were caused by micro-organisms, it was natural that by reasoning from analogy the con-clusion was reached that cancer was also a parasitic dis-ease. Earnest workers in all parts of the civilized world have investigated the subject; various methods of tissue

staining, cultivation, and inoculation have been utilized; numerous intra-cellular and extra-cellular bodies have been discovered and described; but the numerous claims of having isolated the essential cause of cancer have never yet been substantiated. Searching criticisms from different reliable sources have shown almost conclusively that these bodies are not living organisms, but the products of degeneration of the cell protoplasm of a nonparasitic nature.

Senn claims that the histology and histogenesis of cancer speak against a parasitic origin of the disease, because of the difference in the histologic structure of the cells which constitute the mass in carcinoma and in inflammatory products. Carcinoma differs morphologically according to the structures in which it originates, while inflammatory products present the same structure independent of their anatomic location or character of the tissue involved. In other words, carcinoma of the breast when transported by metastasis to the liver produces typical breast cancer in the liver, while inflammation of the breast transported to the liver produces ordinary hepatitis.

Senn states that the results of implanation and inoculation experiments have so far failed in establishing the parasitic theory of carcinoma. The two objections to the validity of the claim are:

1st. The variety of microbes and bodies which have been found in carcinoma tissue by different experimenters and for all of which—at different times and by different authors—the same specific pathogenic qualities have been claimed.

2d. The histologic structure of the products of im-

planation of carcinoma tissue—or inoculation with the supposed cancer germs—does not correspond with the structure of a true carcinoma.

Senn states that no well-authenticated case of inoculation carcinoma has occurred among surgeons who have frequently injured their fingers and hands during operations for carcinoma, while inoculation tuberculosis from the same cause has been frequently observed. The same can be said of persons who take care of carcinoma patients, or who live in the same room with them. In the case of an inoperable carcinoma of the leg, Senn implanted subcutaneously fragments of aseptic carcinoma tissue at two points on the affected limb. During the first two weeks little nodules formed at the point of inoculation, but then gradually disappeared.

On May 4, 1901, Senn inoculated himself with carcinoma tissue immediately after he had completed a radical operation for advanced carcinoma of the lower lip. The patient from whom the malignant graft was obtained was an Irishman sixty years of age. The submental and submaxillary lymphatic glands were involved. The glands were immersed in warm saline solutions, and from one of them a fragment the size of a split pea was used for implantation. A small incision was made about the middle of the forearm, under strict aseptic precautions. One of the margins of the wound was undermined sufficiently to make a pocket large enough to receive the graft. After implantation, the wound was closed with a horse-hair suture and iodoform collodion. The carcinomatous nature of the glandular affection was proved by microscopic examination of the gland from which the graft was taken. In the course of a week a nodule the size

of a pea made its appearance, which remained stationary
for two weeks, and then gradually disappeared.

Dr. Roswell Park, to whose enthusiasm and inde-
fatigable industry was due the establishment of the New
York State Pathological Laboratory for the Study of
Cancer, takes the opposite view. He claims that the
infectiousness of cancer has been proved, but admits
that the exact nature of the organism has not been demon-
strated. He says that it is not now believed that cancer
is due to a bacterium, but to a parasite, perhaps similar
to the plasmodium of malaria. Little is known of these
lowly forms of animal life, and it has not yet been de-
termined whether Koch's laws for the determination of
the infectious nature of a given disease are valid when
applied to them. In the Buffalo Laboratory, these organ-
isms have been found whenever conditions were favor-
able, and the introduction of cultures made from them
has produced fatal results in animals, although the inocu-
lations have not invariably produced distinct carcinomata.
Park states that Cohnheim's theory explains the presence
of certain cells in unusual localities, but offers nothing
to explain the peculiar behavior of these cells, which
constitute the essential feature of malignant growth. He
claims that the parasitic theory is much more satisfac-
tory than the cellular theory, and substantiates his views
with arguments by analogy, by comparative pathology,
by miscroscopic findings, and by clinical observations.
He states that the study of tumor formations in the
vegetable kingdom shows a striking analogy between the
proposed parasitic theory of the origin of cancer in ani-
mals and the known relation of insect infection in plants.
Botanists have shown that tumors occur in trees. They

vary in size from a trifling gall to a large woody mass, and are frequently spoken of as "tree cancers." The infectious agent or parasite is a minute insect, which disturbs cell growth and produces cell proliferation. Usually there is a traumatism of the bark with infection of the growing wood beneath. A combination of etiologic factors is necessary—the infection atrium and the infectious agent. Without the atrium the insect could not enter; without the agent the breach would be healed without pathologic change.

Park states that the comparative pathology of tumor formations in the lower animals furnishes an equally strong argument in favor of the parasitic theory of cancer in the human race. Various tumors occurring in insects and invertebrates have been demonstrated to be due to protoza. The higher we go in the animal scale the more closely do these tumors resemble those in the human being, until the histologic characteristics are almost exactly similar. One cannot avoid the conclusion that tumors in animals and man are due to the same general cause. If, then, their existence in animals can be proved to be of parasitic origin, it strengthens the conclusion in favor of a similar origin for such lesions in man.

Park states that metastasis is regarded as the principal evidence of infectiousness in all infective diseases—from the most acute of the septic and pyemic type to the slower manifestations of tuberculosis. The similar manifestation in cancer is a like evidence of its infectiousness; if it means anything in the one case, it has exactly the same meaning in the other. As the surgeon watches a case of melanotic sarcoma of the leg and sees the gradual transmission of the disease up the limb, and

becomes still later aware of the involvement of the liver, then of the lungs, and then of the various other parts of the body, how can he help but say that this is a disease which travels along the same paths and after the same fashion as does tuberculosis; or, when he sees cancer *en cuirasse* following an operation for cancer of the breast, how can he avoid the conviction that he has here to deal with a slowly creeping infection which is gradually extending and travelling as only an infection can?

On the microscopic appearance of cancer, Park says that it is a well-known fact that in and between cells of cancer growth are seen peculiar forms or particles, which have been regarded by some as parasites, by others as a product of cell degeneration. No such appearances are noted in healthy tissue, or in the infectious granulomata, or in the truly benign tumors. They must be either cell degenerations or parasites. Exactly similar appearances have been produced in large numbers after inoculation with cancer material, but no one has been able to produce such degenerations under other circumstances.

Under clinical observations confirmatory to the parasitic theory of the cause of cancer, Park reports the case of a woman with epithelioma of the chest wall following a burn. As a result of the cicatrix her arm was bound down to her side, and a cancerous ulcer appeared on its under surface. He states that numerous instances in which cancerous infection has followed the track of instruments, such as the trocar, afford other evidence whose value is undeniable. In regard to the objection raised to the infectiousness of cancer, based on the fact of the almost constant failure of investigators to reproduce the disease by inoculation or implantation, he says that the

failures were due to ignorance in regard to the conditions which favor the life of minute organisms. By observing certain conditions at the Buffalo Laboratory, carcinoma has been produced in a number of animals by inoculation, and one positive demonstration of the infectiousness of the disease is worth more than one hundred negative experiments.

Leaving the discussion of the essential cause of cancer, and withholding judgment as to the merits of the rival claims of the intrinsic cell and extrinsic parasite, the writer wishes briefly to discuss some of the existing factors which clinical experience clearly prove to bear an important relation to the actual development of the disease.

Heredity.—The mysterious influence of heredity, a force transmitted by a single cell to the entire organism, by which physical attributes, intellectual powers, moral qualities, and pathologic tendencies are perpetrated from parents to offspring, markedly influence the occurrence of cancer. Twist the facts as you please, the inevitable conclusion cannot be avoided that cancer runs in families. Here, as in the following sections, the explanation may be made compatible with either of the two theories of the essential cause of the disease. If the cellular theory be correct, then there is diminished physiologic resistance to the growth of the matrix of embryonal cells, and they assume active tissue proliferation. If, on the contrary, the parasitic theory be true, then it is an increased susceptibility of tissue from diminished physiologic resistance to action of the micro-organism, and they effect localization and produce their characteristic results.

Age.—So constant a factor is age in the development

of cancer that it is used as a practical diagnostic sign in doubtful cases. Cancer is a disease of middle and advanced life. While the forces of growth and reproductive activity are greatest the tendency to cancer is least. When cancer develops in opposition to these forces the prognosis is gravest. A well-known surgeon once said with reference to the relation of age to the probability of cure, "The older the better."

Sex.—The influence of sex on the occurrence of cancer is demonstrated by the fact that the disease occurs nearly twice as often in women as in men. This is probably due to the functional activity of the breast and uterus in the one sex and the functional inactivity of the analogous organs in the other.

Race.—The bearing of the race on cancer is evident, as it is stated that in the United States cancer rarely affects the Indian, and the negro is attacked less frequently than are the whites. As a rule, the higher the civilization the more prevalent the disease.

Diet.—It is supposed by some authorities that diet plays an important role in the development of cancer, but its influence is denied by others. It is claimed that the disease is less frequent in the vegetarian than in the flesh-eaters—the statement being supported by statistics apparently proving that nations living on rice are less susceptible than those living on animal food, and that in any country the portion of the population which, either through taste or necessity, lives on vegetables, is more immune than their fellows whose diet contains a large proportion of meat.

General Health.—The constitutional condition has an uncertain influence on the development of cancer; but it

is stated that cancer is a disease of persons whose previous life has been healthy, and whose nutritive vigor gives them otherwise a prospect of long life.

Traumatism.—Traumatism is an important factor in cancer, for in at least 20 per cent. of all cases of the disease the patient will give a history of local injury to the part affected. The injuries are usually of trivial nature, and the explanation offered is that serious injuries cause vigorous reaction, with complete restoration of the part, while minor injuries are often followed by incomplete reaction, and the tissues are left with diminished pathologic resistance.

Local Irritation.—It is a well-accepted fact that local irritation acts as an exciting cause of cancer, as manifested by the frequency with which the disease attacks parts and organs most often the seat of repeated and prolonged irritation. As examples may be cited the lip cancer of smokers, the scrotal cancer of chimney-sweepers and the close association between gall-bladder and cancer of the liver.

Geographical.—The habitat of the individual increases or diminishes the probability of cancer. The disease is rare in the arctic and tropical regions, and frequent in the temperate zone. It is almost unknown in Iceland, Greenland, and Africa, and common in America, Europe, Asia, and Australia.

Topographical.—The influence of topographic location is demonstrated by the difference in mortality records in rural communities and in manufacturing centres. As a general proposition, it may be stated that the rate of

cancer is highest where the struggle for existence is hardest and the density of population greatest.

Dismissing the subject of the etiology of cancer, and omitting for lack of space all reference to the histology, symptomalogy and diagnosis of the disease, the question of its treatment will next be considered.

TREATMENT OF CANCER.

The great and vital importance of the proper management of carcinoma can only properly be appreciated after a recognition, first of the frequency of the disease; second, the apparent rapid increase of the disease, and third, the improvement in results that has followed the modern methods of radical surgical extirpation of the disease.

The following figures are gathered from a recent article of Dr. Frederick S. Dennis, of New York. In 1890 the death rate from cancer for the United States was 53 per 100,000 population; for England, 67; for Scotland, 60; for Austria, 52; for Ireland, 45; for Prussia, 43; for Italy, 42. In England there are 7,000 deaths annually from cancer and 30,000 patients suffer at all times from the disease. In the United States, by the census, there were 18,000 deaths from cancer in 1890 and conservative estimates now place the death-rate at over 25,000 per annum. Based on the proportion of deaths to cases, as calculated for England, there are to-day over 100,000 cases of cancer in the United States. Statistics also show an apparent alarming and rapid increase in the number of cases of cancer. It has been calculated that in recent years cancer of the breast alone has increased 12 per

cent. in Connecticut; 50 per cent. in the District of Columbia; 115 per cent. in Rhode Island, and 179 per cent. in Philadelphia. Roswell Park makes the startling statement that if cancer continues to increase during the next ten years as it has done in the past ten, at the end of a decade more people will die in the State of New York from cancer than will die from small-pox, typhoid fever, and tuberculosis combined.

It is but fair to state that Senn and others claim that this increase is more apparent than real, and is due to more accurate diagnosis, more frequent post-mortems, more general resort to operative intervention, and to increased longevity.

Statistics in regard to the improvement in the permanent results of operation for cancer are prolific, but not easily concentrated to comparative figures. Dennis reports eighty-seven cases of malignant growths operated upon and cured; the nature of the disease in each instance being demonstrated by microscopic examination, and the permanency of the result tested by careful subsequent observations for a period, in no instance less than three, and in some of over twenty-years.

While Dennis' results are no better than those attained by many other surgeons, yet he deserves the thanks of the profession for the arduous labor he has performed in tracing his cases and proving the fallacy of the views of many of the laity that cancer is incurable.

In actual practice almost every conceivable treatment has been applied to cancer, and while the dearly-earned experience has united the profession in the conclusion that at the present time there is but one possibility of

cure—namely, early and radical surgical intervention—it will be well to review other methods which have been tried and failed.

Electricity.—Electricity, which has promised so much in so many different fields of medicine, and which has practically yielded so little of postive therapeutic value, has been long, faithfully, and variously employed in the treatment of cancer. Constant and interrupted currents have been applied, electrylosis and cataphoresis used, and lastly, the influence of the X-ray tested, all with practically negative results.

Drugs.—The local application of methylene blue, formaldehyde, and similar antiseptics, has resulted in no good except to diminish the offensiveness of discharge in ulcerative cases. The parenchymatous injection of alcohol, acetic acid, and other sclerotics has accomplished nothing save in a few cases where they have temporarily arrested the local extension by impairing the blood supply through cicatrization of adjacent tissue. The internal administration of iodide of potassium, arsenic, cundurango, turpentine, cinnamon, clover tea, and a host of others has served no purpose, unless it has been to keep alive the flickering hope of poor unfortunates painfully conscious of their doom.

Toxins and Serums.—The injection of the combined toxins of the streptococcus erysipelatus and of the bacillus prodigiosus, which for a time excited so much attention, has ceased to be seriously considered. Even its originator, Coley, states that it has only an inhibitory influence on carcinoma, and is but rarely curative. Cancroin, a toxic product derived from cancerous tissue by Adam-

kiewiez, has been extensively tried, but has proved to be without specific virtue. Blood serum, obtained from horses, goats, and sheep, injected with cancer juice, or the toxins of the supposed cancer protozoon, have likewise failed. Despite these facts, the serum therapy of cancer offers a promising and fascinating field for investigation. If cancer be due to a parasite, if it can be isolated and cultivated, if its peculiarities can be studied and its idiosyncrasies noted, in the words of Dr. Park, "It is not too much to hope that some agent, be it either vegetable or mineral drug, or animal antitoxin, may yet be discovered by which the ravages of the disease may be checked or prevented."

Caustics.—Chemical escharotics were once largely used by the profession in the treatment of superficial forms of cancer, but they have now been practically abandoned, and are only of interest owing to their frequent revival by quacks and charlatans, who reintroduce them as new discoveries, cloaked in mystery and vested with marvellous properties. A caustic causes coagulation of the protoplasm of the cells with which it comes in contact. It acts chemically, has no selectivity, and destroys healthy and diseased tissue alike. It produces the formation of a sphacelus which separates from adjacent structures by ulceration. Its action is slow and the pain produced prolonged and extreme. Its destruction of tissue is uncertain in extent, and the carcinoma is frequently not removed, and sometimes healthy tissue is unnecessarily sacrificed. It leaves an open, suppurating wound, which entails a long period of convalescence, and exposes the

patient to the dangers of secondary hemorrhage and pyemic infection.

When it is remembered that the only object in the use of a caustic is to remove the diseased tissue, and when it is known that this can be done much more speedily, accurately, and painlessly by the knife, with shorter period of convalescence, less resulting deformity, and diminished risk to life, it is at first a matter of surprise that cancer quacks prosper. Competition with them, however, will soon supply the explanation—competition, not in a pecuniary sense, for they have consistency in their effrontery, and their charges are in proportion to their promises—but competition in a higher sense; contention for a case, not a fee; effort to save a patient from what is believed to be a sacrifice of the one and only chance of recovery—namely, radical surgical removal before regional and general infection make the case inoperable. Quacks have apparently no professional restrictions, no moral obligations, and no legal responsibilities. Free from the provisions of the Code of Ethics of the regular profession, they advertise extensively in all the popular publications of the day, offering hope and promising cure to despairing individuals ready to grasp at straws. Communication once established, the victim is bombarded with reprints of histories of cases successfully treated, copies of eulogistic editorials from venal religious papers, and sweeping letters of endorsation from ignorant and credulous ministers of the Gospel. The patient secured, the lotion or paste is applied. If the disease be a warty excrescence, or a benign tumor, or a syphilitic sore, the case is cured and the result recorded.

If it be cancer, the case dies, and the profit is pocketed. Yet, the public, which has organized a Society for the Prevention of Cruelty to Animals, and the Legislature, which has passed laws to prevent money being obtained under false pretences, stand idly by, and the medical profession, when it attempts to expose outrages being committed, is charged with being actuated by unworthy motives.

Operative Treatment.—The early and radical use of the knife offers the only possible cure for cancer. The theory that cancer is a local manifestation of a constitutional dyscrasia has been abandoned. The fact that cancer is at first a strictly local disease and becomes regional and general later by extension and metastasis, has been accepted. If the diagnosis of cancer can be made early while the disease is yet local, and if its anatomical position is such as to permit of its complete removal, the prognosis is good. If the diagnosis of cancer is delayed until the disease has become regional by extension through the lymphatics, the prognosis is bad. If the diagnosis of cancer is postponed until the disease has become general by dissemination through the veins the prognosis is hopeless. It will thus be seen that the cases early diagnosticated are the ones that give the cures, and the cases only recognized late in their pathologic life give the failures. Authorities state that after the disease has been in existence for more than six months removal, no matter how complete, is almost certain to be followed by recurrence.

Second only in importance to early diagnosis is the completeness of the operation for the removal of the in-

fected tissue. Heidenheim, by exhaustive research, has shown the direction of the regional extension of cancer, and taught the surgeon the necessity of not only removing the organ in which the disease originated, but the adjacent lymphatics as well. In cancer of the breast not only should the mammary gland be amputated, but the axillary and possibly the supra-clavicular space opened and cleared of all fat fascia and lymphatics. In cancer of the cervix, not only should the uterus, but the retro-peritoneal glands of the pelvis, be removed. In cancer of the penis, not only should the organ be sacrificed, but the inguinal glands of both groins should be removed. As operations for cancer have become more radical, the ultimate results have become more favorable.

Methods to Hasten Epidermization, With Special Reference to Skin Grafting[*]

Every practitioner is frequently called on to treat loss of cutaneous surface due either to injury or disease. If the area is small, repair is usually rapid and complete, but if it is large, repair often progresses to a certain point, and then ceases. In the one case the capacity of the germinal cells is sufficient to meet the demands made upon them; in the other the amount of material required is more than they can produce.

It is the object of this paper to discuss methods to hasten healing in cases where the process is slow or at a stand still. No effort will be made to review the literature of the subject, and only the results of practical experience will be given.

To secure epidermization the first step should be to stop suppuration. The second should be to stimulate normal regeneration and to protect the embryonal cells resulting. The third, in case the first two are insufficient, should be to augment nature's reparative forces by grafting the bare area with epithelial tissue of sufficient vitality not only to live, but to grow.

These three indications for treatment must be followed in the management of every granulating wound, whether it be a small ulcer or an extensive burn. They cannot

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[*] Read at a meeting of the Medical Society of Virginia, Roanoke, Va., September, 1904.

be carried out independently, but must be combined. They will not be discussed separately, but collectively under the different dressings commonly employed.

Moist Dressings.—After the preliminary cleaning of the wound and adjacent surfaces, the first treatment usually tried is the moist dressing, the character varying from the cold water dressing of our forefathers to the moist corrosive dressing of the antiseptic extremist of the present day. The method of application consists in saturating a pad of absorbent cotton with the fluid selected, applying it to the raw surface, and preventing rapid evaporation by covering it with a layer of oil silk. The cotton should be wet as often as it becomes dry, and should be changed as often as it becomes soiled. The solution employed should not be a strong antiseptic, as it would kill cells as well as germs, but it should have an inhibitory action on microbic life. The three that will be found most satisfactory are *chloral hydrate solution* (chloral hydrate gr lxiv; water oij) ; *Thiersch's solution* (salicylic acid gr xxx, boric acid drams iij, water oij) ; and *acetate of aluminum solution* (alum drams vj, acetate lead drams ixss, water oij). They may be used either hot or cold, and should be employed in conjunction with rest and elevation. I have had many a swollen and rebellious leg ulcer come to me, scarred with caustics, gritty with antiseptic powders, or filthy with greasy ointments, but not one that did not yield readily when the patient was put to bed, the limb elevated, and the part treated with hot chloral dressings.

Dry Dressings.—The treatment of granulating surfaces by dusting them with antiseptic powders has been made undeservedly popular by the advertisements of firms that

had proprietary preparations to sell. The powders most frequently employed are iodoform, aristol, dermatol, bismuth, boric acid and oxide of zinc. In some cases they do good, but in most instances they do harm. Chemically they destroy germs and lessen suppuration; mechanically they destroy embryonal cells and retard healing. When first applied to a wound decided improvement is seen, but continued use is followed by irritation due to absorption of serum and the formation of crystalline concretions that act as foreign bodies, or broad incrustations that prevent the escape of pus or other wound secretions. I am free to say that I do not use dusting powders. There has not been a grain of iodoform in my private hospital for the last three years, and its banishment has not proved detrimental to patients, but exceeding beneficial to the atmosphere of the institution.

Oleaginous Dressings.—The use of salves and ointments in the treatment of superficial wounds has fallen into unmerited disfavor. Because, before the day of antiseptic surgery, they were abused is no reason why they should now no longer be used. Some preparations quickly become rancid and should be avoided; others remain sterile indefinitely, and may safely be employed. Vaseline, lanoline and castor oil, plain or medicated, will give better results in some cases than any other application. They exert a feeble antiseptic action, thus lessening suppuration; they exclude the air, thus relieving pain; and they prevent the adhesion of overlying dressings, thus saving the embryonal cells from mechanical injury. In extensive burns I have found nothing better in the early stages than a 5 per cent. mixture of ichthyol and vaseline, and in sluggish granulations, especially of a tuberculous char-

acter, I have never failed to see good come from the application of a combination of 1 per cent. carbolic acid, 5 per cent. Balsam Peru, and 94 per cent. castor oil.

Nutritive Dressings.—Considerable benefit will sometimes be derived in the treatment of a granulating wound by the use of a dressing that supplies food directly to the germinal cells and their offspring. Proliferation is often arrested by starvation, and feeding is the logical remedy. The agent employed should be aseptic, non-irritating, and should contain nutritive material in an easily absorbable form. The preparation that in my opinion most nearly meets these requirements is Valentine's Meat Juice. It is sterile, contains no alcohol, is rich in food stuff, and has practically the same percentage of sodium chloride as the normal serum of the blood. It should be diluted with three parts of water, warmed to the temperature of the body, and applied on cotton in the form of a moist dressing. My experience has been that it does a great deal of good for a short while, but then loses its effect. As soon as pale granulations become pink and healthy is has fulfilled its function, and should give place to some other dressing.

Alterative Dressings.—Cells, like individuals, sometimes without assignable reason, develop disturbances of nutrition requiring alterative treatment. In the management of a granulating wound there is often call for local medication. Experience alone can teach the surgeon the agent to employ and the time and method of its application. Nitrate of silver, mercurial ointment, chloride of zinc and sulphate of copper are all useful and time-honored remedies. Among newer preparations must be mentioned proto-nuclein. I have several times seen in-

dolent or foul granulating areas that had defied a half dozen other lines of treatment improve under its use as if by magic.

Protective Dressings.—In direct contrast to granulating surfaces that need stimulating or alterative treatment are those that are doing well and only require protection. When the wound is healthy and healing progressing satisfactorily, nothing is more mischievous than meddlesome interference. All that should be done is to prevent infection by cleanliness, and to avoid injury to the newly formed cells by mechanical protection. Cleanliness is secured by changing the dressings as frequently as they become soiled and bathing the wound with normal salt solution. Protection is best accomplished by interposing some impervious material between the granulations and the meshes of the overlying gauze, into which they would otherwise become entangled. In my experience, the best results follow the use of strips of rubber dam, collodion film, or cargile membrane placed latticewise so as to afford drainage. Rubber dam is the material used by dentists, and can be sterilized by boiling. Collodion film can be prepared by pouring collodion on an aseptic sheet of glass, allowing it to harden and then cutting it in strips. Cargile membrane is made from the peritoneum of an ox, and can be bought on the market in germ proof envelopes.

Proliferating Dressings.—When the destruction of skin is so extensive that the normal reparative power is insufficient to cover the granulating area with epithelial cells, recourse must be made to skin grafting. It has long been known that bits of cuticle properly planted on fresh wounds or healthy granulating surfaces would

become adherent and grow, thus protecting underlying structures and acting as independent foci of epidermization for adjacent tissue. The application of this fact with epithelial cells secured from different sources and applied by various methods has enabled the surgeon to heal wounds quickly and certainly which otherwise would be slow to close, or perhaps become permanent ulcers.

Skin grafting, when practiced on newly made wounds, is called primary grafting. When practiced on granulating surfaces it is called secondary grafting. If the surface be a fresh one, care must be taken perfectly to arrest hemorrhage before applying the grafts, otherwise bleeding will detach them. If the surface be an old one, care must be taken to stop suppuration before applying the grafts; otherwise pus germs will devitalize them.

Skin grafts may be obtained from the patient, and then they are called autografts; they may be cut from another person, and then they are called heterografts; or they may be secured from an animal of a different species, and then are called zoografts.

There are three recognized methods of skin grafting. Reverdins', consisting in cutting small particles from the superficial layers of the skin with scissors and planting them at intervals over the surface to be covered; Thiersch's, consisting in cutting broad strips from the superficial layers of the skin with a razor and placing them so as completely to cover the wound area; and Wolfe's, consisting in the dissection of a piece of skin the entire thickness of the structure and fitting it to the defect to be remedied.

The dressing after any of the above methods consists of a lattice work of protective strips over which is placed

a pad of gauze wet with normal salt solution. This should be removed and replaced at the end of the third day, and the subsequent management of the case carried out on general surgical principles.

The instruments required for skin grafting are so few, the operation itself so simple, and the results secured so immediate and satisfactory, that the surgeon who does not avail himself of it in suitable cases does an injustice both to himself and his patient.

Primary skin grafting should be employed after the removal of an epithelioma or other superficial growth, provided, infection can be prevented, hemorrhage arrested, and ligatures and sutures avoided. The depression due to the removal of tissue will fill up beneath the grafts and the deformity will be less than anticipated. I have removed a growth the size of a silver dollar from a nose, grafted it at once with skin from the arm, and discharged the patient with a perfectly healed wound in ten days from the operation.

Secondary skin grafting should be employed when ligatures are used to arrest bleeding, or sutures to secure partial coaptation; where infection is likely or already exists, or where the excavation is deep and a large amount of granulation tissue is necessary to fill it. In operating for cancer of the breast, where the approximation of the margins of the wound is secondary to extirpation of the diseased tissue, I remove the malignant growth as completely as possible, bring the cut edges of the skin together as nearly as practicable, apply a protective dressing, and a week or ten days later remove the stitches and skin graft the granulating area.

Reverdins' method should be employed where the area

to be covered is small, and where the administration of a general anesthetic is contraindicated. The surface to be grafted and the site from which the grafts are to be taken should both be prepared. The skin is then elevated into a cone by means of a sharp tenaculum and a small piece snipped from its superficial layer by means of a pair of curved scissors. The fragment is at once transferred to the area to be grafted and carefully seated on the granulations, care being taken to prevent the edges curling inward, thus preventing apposition of raw surfaces. This is repeated until a sufficient number of grafts have been planted quickly to stud the bare area. The operation of cutting the grafts can be made painless by the use of the chloride of ethyl spray. I have found the above method very satisfactory, especially in weak, nervous patients, where a more formidable operation would have a bad effect. The space between the grafts is rapidly covered and the resulting scar is good.

Thiersch's method should be used when the surface to be covered is large, and when the patient is either under an anesthetic or its administration will be compensated for by the more rapid recovery it promises. The grafts are obtained by making the skin tense and fat, either manually or by special hooks, and cuttings off the superficial layers by a to and fro sawing motion of a sharp razor. The larger the size of the grafts the better. Usually they are an inch wide and four or five inches in length. Care should be taken to remove only the upper layer of the skin, otherwise the wound inflicted may prove as difficult to cure as the wound the surgeon is endeavoring to remedy. As the grafts are cut they are dropped into a basin of warm saline solution. Afterwards they are

carefully placed on the area to be grafted, the edge of one graft overlapping that of the adjacent one. Thiersch's method of skin grafting is the one most frequently practiced, and the one that gives the most brilliant results. The objections to it are that it necessitates the use of an anesthetic and the site from which the grafts are cut is painful and takes some days to heal.

Wolfe's method should only be employed in exceptional cases. The surface of the area to be grafted should be thoroughly revivified and the margins made fresh and vertical. All bleeding should be completely arrested. The new skin to be used as a graft must be dissected from some other site. The entire thickness of the skin should be removed, but no subcutaneous fat taken with it. The outline of the incision should preferably be an ellipse to permit of closure of the defect by sutures. The skin removed should be one-third larger than the defect to be covered to allow for shrinkage. The graft after having been placed in its new position may be retained by sutures or reliance placed on overlying dressings. The method is uncertain in results, but may sometimes be used with advantage. I remember one case where I planted a single piece of skin, having an area of some 16 square inches. The graft was obtained in retrenching the scrotum of a man for varicocele, and was planted on a woman who had been operated on some days previously for cancer.

In addition to the recognized methods of skin grafting just described, occasional reference will be found to grafting wounds with the skin of an egg, with the pellicle of a blister, and with dry epidermal scales, such as scrapings from callosities or dandruff from the head. I have

tried all these expedients with unsatisfactory results. The only reasonable sources from which to obtain vital epithelial tissues are the skin of the patient, autografts; the skin of another individual, heterografts; and the skin of a lower animal, zoografts.

Autografts are usually cut from the patient's thigh or shoulder. They furnish the material most likely to prove successful, and should be employed except in cases where the patient's general condition is bad or where the area to be grafted is very extensive. The practice, however, is not free from annoyance or distressing complications. A woman came to me not long ago with an epithelioma of long standing on the vertex of her head. It originated in an old scar and was about four inches in diameter. I shaved her head, made an incision around the growth, and scalped her. The wound was treated with a moist antiseptic dressing until it had filled with healthy granulations to the level of the margins. I then skin grafted the bare surface by Thiersch's method, cutting the grafts from the deltoid region. The grafts took beautifully, and in two weeks she was apparently well. Several months later she came back to the hospital. Her head looked like a tonsured monk, and the skin on the bald area was perfect, but the shoulder from which the grafts had been cut gave her much pain. On examination it was found to be the seat of a keloid growth the size of a man's hand. I had cured her of cancer only to give her keloids.

Heterografts are obtained from another individual, from amputated extremities, or from fresh cadavers. They usually grow well, and should be employed when they can be secured from a satisfactory source. They entail the danger of infecting the patient with syphilis, tuberculosis, and other diseases, which must be carefully

guarded against. The question of the necessity of the grafts being the same color as the skin of the patient on which they are planted is still unsettled. It is claimed that a negro skin grafted on a white person will lose its pigment, and that white skin grafted on a negro will become pigmented. A few years ago I had an opportunity to test the question. A negro man as black as the ace of spades had his leg crushed. It was amputated, but the flaps sloughed, leaving a granulated area three or four inches in diameter. It was determined to graft skin and my assistants were directed to prepare the man for the operation at the next clinic. When the patient was brought into the amphitheatre I had just finished amputating the leg of a white man. On the spur of the moment I decided to cut the grafts from the white leg and plant them on the black one. The operation was done by Thiersch's method with satisfactory results, the patient being discharged as cured in three weeks' time. Two years afterwards the man came back to the clinic on account of some other trouble. An examination of the grafted stump showed that the grafts were as white as they were on the day they were planted. While one case proves little, the result is significant. It has for obvious reasons deterred me from reversing the experiment and grafting a negro's skin on a white patient.

Zoografts are obtained from one of the lower animals, the frog, chicken, pig, dog, cat, rabbit or guinea pig being most commonly used. They do not grow as readily as grafts from the skin of a human being, and they should not be employed when other sources of supply are available. Still there are certain conditions where they are not only useful, but are the only means by which the patient can be cured.

A small negro child was brought to the clinic last winter, who had been severely scalded several months before. Some healing had occurred at the margins of the burns, but effort at repair had ceased, and there was a granulating surface on the body covering an area of over one hundred square inches. The child was treated until the granulations were healthy, and then came the question of where to get the skin with which to graft it. The child was too small and its condition too feeble to furnish the grafts from its own person. The mother, relations and friends all declined to make the necessary sacrifice, no jail bird would volunteer as a victim even at the promise of liberty, and applications at all the hospitals in the city seemed to show that for the time at least surgeons had stopped amputating limbs. As a last resort, recourse was made to zoografts. A healthy six weeks' pig of chocolate color was purchased. It was carefully shaved and given frequent scribbings and antiseptic baths. The day before the operation the belly was prepared as if for abdominal section. The grafting was done before the class of the University College of Medicine. The pig was brought in on one table, the pickaninny on another. Grafts were cut from the belly of the pig and planted on the back of the child. The usual dressings were applied, and for two weeks everything went well, and it was thought the operation had been completely successful. The wound itched, however, and one night the child got its hands beneath the dressing and scratched off a large portion of the new and tender skin. While the result was a partial failure, enough of grafts remained to demonstrate that pig skin would grow. More recently I have had other cases that were perfectly cured by this method.

To Cut or Crush In Stone of the Urinary Bladder? *

The question whether to cut or crush in cases of stone in the urinary bladder is no new one, as lithotomy and lithotrity have both been practiced for over a thousand years. The opinion of the profession, as to the relative value of the two methods has varied, first one and then the other gaining ascendency.

In the first century Celsus wrote a clear description of lithotomy, and the operation was frequently performed. In the tenth century. Albueasis described an instrument which could be passed along the urethra, "seize the stone, crush it, if soft, and remove it." In the seventeenth century Beaulieu, a Franciscan monk, performed several thousand perineal lithotomies and is reported to have operated on thirty-eight consecutive cases in Versailles without a death.

In 1818 Civiale invented his litholabe and some years afterwards reported seventy-eight cases in which he had crushed and removed stone, with five deaths. In 1878 Gross advocated the cutting operation and reported 163 lithotomies, with fourteen deaths. In the same year Bigelow invented his evacuator, and the possibility of doing lithotrity at one sitting (or litholapaxy, as it was then called) created great enthusiasm. In 1884 Henry Thompson reported 116 cases of lithotrity, with six

deaths. In 1890 Hunter McGuire reported twenty-six cases of supra-pubic cystotomy for stone, with one death. In 1893 Chismore reported fifty-four cases of lithotrity, done by a series of short sittings under cocaine, with no deaths.

Having attempted to show the curious vacillation of surgical opinion as to the relative merits of the two operations in the past, I will now try to find expression for the accepted views of the present. I believe it can be most fairly done by quoting from new and standard textbooks, which treat of the subject.

White and Martin.—"The two received methods of treatment are litholapaxy and cystotomy. Litholapaxy is in both adults and children the method of choice."

Lydston.—"The supra-pubic operation is so safe in favorable cases that it is preferable to litholapaxy unless the surgeon is expert in its performance."

An American Text-Book of Surgery.—"The possible methods of removing a given stone from the male bladder are perineal lithotomy, supra-pubic lithotomy and litholapaxy. The remarkable changes brought about by the introduction of the last named method has greatly reduced the field of the first two."

Wyeth.—"The conditions in which lithotrity is to be preferred to lithotomy are rare."

Treves.—"Litholapaxy is now the recognized operation for all cases of vesical calculus in males."

Moullin.—"Calculi must be removed from the bladder by crushing or cutting. The former is more common and has to a great extent superseded the latter."

Wharton and Curtis.—"Lithotomy is indicated in cases not suited for crushing, although the recent improve-

ments in supra-pubic cystotomy bid fair to make it the rival of the method by crushing in all cases."

From the extracts given it will be seen that both methods are advised, but the surgeon is taught by the majority of the authorities to perform lithotrity as the operation of election and lithotomy as the operation of compulsion. In other words, that the cutting operation should only be done when the crushing operation is impossible. I believe this teaching is a survival of the pre-antiseptic era and does not accord with the practice of the modern surgeon. Twenty years ago, when the use of the knife was attended by danger to life, from septicemia, or slow and complicated convalescense from suppuration, it was undoubtedly sound, but to-day—with the aseptic and antiseptic technique and the perfection of the supra-pubic operation—it is false and misleading. From a limited personal experience with both operations, and a careful study of the literature of the subject, I believe lithotomy should be the operation most frequently performed and lithotrity reserved for a few carefully selected cases. The demonstration of the truth of this statement can best be made by a comparison of the advantages and disadvantages of the two operations under separate headings.

Mortality.—Figures seem to show that lithotrity is safer than lithotomy. But in making a deduction from statistics it must be remembered that they are based largely upon work done before the introduction of antiseptics; that simple and easy cases were crushed and difficult and complicated cases cut; and, finally, that the results of a few expert lithotritists are compared with those secured by a number of average lithotomists.

Requisite Skill and Experience.—Lithotrity is undoubtedly a more delicate and difficult operation than lithotomy. It is blind surgery, liable to be attended by annoying complications or dangerous accidents, and should not be undertaken by one not thoroughly familiar with the manipulation of instruments in the urethra and bladder. Lithotomy, especially if done by the suprapubic route, is one of the simplest operations in surgery and may safely be attempted by any one of fair experience in general operative work.

Injury to the Soft Parts and Septic Sequences.—It is claimed that lithotrity creates no breach of continuity of tissue, while lithotomy leaves a wound of considerable gravity, and therefore, the former operation is followed by more rapid recovery. This is true in selected cases in the hands of expert operators, but in many instances, where the stone is large and hard, and the surgeon less experienced, manipulations are prolonged and rough, and there is considerable bruising and laceration of the mucous lining of the urethra and bladder. Copious hemorrhage is not uncommon and the bleeding points are inaccessible to direct hemostasis. There is practically no drainage, and the septic sequences sometimes follow, manifested by urethral fever, urethritis, cystitis, prostatitis, epidydimitis or phlebitis.

In lithotomy, especially if done by the supra-pubic method, there is no contusion of the mucosa of the urinary tract, but simply a clean cut incision through unimportant structures. There is practically no bleeding, and if it does occur from complications, it can be controlled by the ligation of vessels or direct tamponade of the bladder. If sepsis follows, which is unlikely, owing

to the free drainage afforded, it can be combated by irrigation of the wound, bladder and urethra with antiseptic solutions. The duration of convalescence after lithotrity is uncertain. It may be shorter than lithotomy—it may be longer.

Ability to Diagnosticate and Treat Other Pathologic Conditions.—Stone in the bladder is usually found at the two extremes of life. In the young it is usually uncomplicated; in the old it is often associated with enlargement of the prostate, severe cystitis, or vesical tumors. Lithotomy has the advantage in both instances, as it avoids the dilatation of the undeveloped penis and small urethra of the one—with the danger of incontinence and impotency; and affords direct examination of the interior of the bladder in the other, making accessible to surgical correction any co-existing disease present, and affording subsequently the necessary drainage of the cavity of the viscus.

Permanency of Results.—There is certainly more liability to the recurrence of stone after lithotrity than after lithotomy. In old men, with enlarged prostates, it is impossible to be sure of removing all fragments after crushing, and it is also possible to overlook a small stone in cases of multiple calculi. If a single particle is retained in the bladder it will act as an exciting cause to the predisposing diathesis and result in the production of a new stone. I recall the case of an old man with a sacculated bladder, in whom stone was twice crushed. On his third return to the hospital I did a supra-pubic lithotomy and removed five small calculi. Since then he has remained well.

Simplicity and Freedom from Mechanical Complica-

tions.—While questions of economy of instruments have no place in surgery, and the fact that lithotrites and evacuators are expensive and perishable, is no argument against lithotrity, the simplicity and freedom from dependence on the mechanical action of complicated instruments is a strong point in favor of lithotomy. Many cases are reported where surgeons had clogging, bending or breaking of the blades of a lithotrite to occur in the bladder, and were forced to resort to the knife to complete the operation. Only recently I found myself in a predicament which would have been ludicrous if it had not been dangerous. I was crushing a soft stone of medium size in the bladder of a boy, aged seventeen, who weighed nearly three hundred pounds; the operation of lithotrity being selected on account of the patient's obesity. The stone was readily seized and crumbled at the first turn of the screw. The instrument was opened and several of the fragments caught and broken. It was then observed that the blades would not close. Every known expedient was tried to free the impaction, but failed. A suprapubic cystotomy was finally done, a sticky, gummy mass cleared from the jaws of the lithotrite and the instrument closed and withdrawn. A subsequent interrogation of the boy secured the confession that some time before his admission to the hospital he had introduced a bolus of chewing-gum into his urethra, which had slipped from his grasp and passed into the bladder, doubtless forming the nucleus of the stone.

Range of Application.—Lithotomy may be done in any case and has no limitations other than those of general surgery. Lithotrity is admitted by its advocates to be contra-indicated in the following conditions
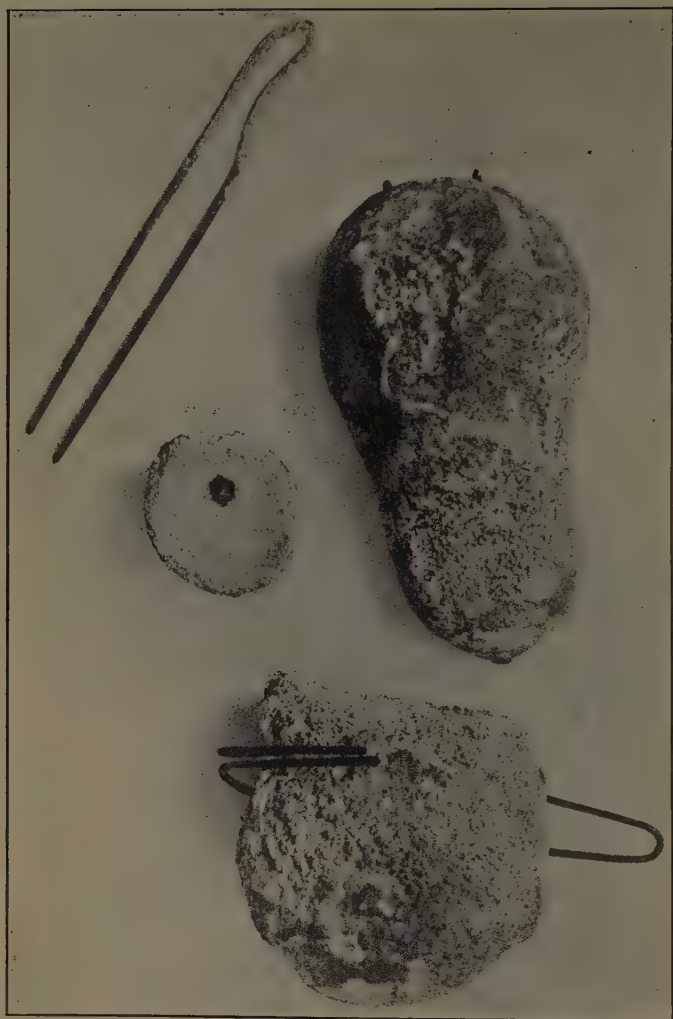
FIG. 7—Specimens of Stone showing Foreign Bodies as Nuclei.

1st. When the stone is hard and cannot be crushed by instruments capable of being used through the urethra.

2d. When the stone is large and cannot be grasped by reasonable separation of the jaws of the lithotrite.

3d. When the stone is brittle and the resulting fragments sharp and irregular.

4th. When the stone is fixed or encysted.

5th. When the stone has a foreign body as a nucleus which cannot be crushed and removed.

6th. When the prostate is enlarged, or the bladder contracted, making it difficult to seize the stone.

7th. When there is a tight or impassable urethral stricture, requiring a long operation to relieve.

8th. When there is ankylosis of the hip joint in a position embarrassing the movements of the lithotrite.

9th. When the general condition of the patient is such as to make shock dangerous and rapid work necessary.

In corroboration of the above I wish to exhibit some specimens of stone with foreign bodies as nuclei, removed by my father, Dr. Hunter McGuire, by lithotomy. It is obvious that an effort to operate by lithotrity would have resulted in failure.

In the history of the cases on which he operated for vesical calculi there are nine instances of stones with foreign bodies as nuclei, as follows: four hairpins, two bullets, one piece of bone, one piece of gum catheter, and one section of a silver catheter. One of these specimens has been lost, one was destroyed by the patient, three are now in the Army and Navy Medical Museum, and the other four are herewith presented.

I also wish to report a case in which I acted as his assistant. · As soon as the stone was caught in the blades

of the lithotrite and subjected to pressure, it flew to pieces as if it were glass. The operation of lithotrity was at once abandoned and the bladder opened above the pubes. The fragments of the stone were gently removed with the finger and were found to have razor-like edges, which would undoubtedly have seriously injured the walls of the viscus had the first operation been continued.

Conclusion.—For fear of being misunderstood, permit me to repeat the views I maintain in regard to the two operations. I do not condemn the crushing operation, for I believe it is the best method to employ in certain cases. What I do condemn is the abuse of the operation by the efforts of its advocates to substitute it for the cutting operation in cases for which it is not suited. As previously stated, I believe that lithotomy should be the operation most frequently employed, and lithotrity reserved for a few carefully selected cases.

Extra-Peritoneal Implantation of the Ureters Into the Rectum in a Case of Exstrophy of the Bladder *

Exstrophy of the bladder is a congenital abnormality due to failure of the ventral plates forming the anterior abdominal wall to unite in the median line. As a result the front wall and roof of the bladder are absent, and its posterior wall, presents through a defect in the abdominal parietes.

The irritation of the exposed mucous membrane, and the constant saturation of the person and clothing with urine makes the condition of the patient one of the greatest distress. Fortunately the abnormality is not very common. Spooner reports only four cases in 116,500 births. From 80 to 90 per cent .of the cases occur in males.

Various operations have been proposed and executed for the relief of the condition. They may be divided into two classes: first, those which attempt to restore the anterior portion of the abdominal wall and bladder by plastic work, and second, those which attempt to divert the urine from the bladder to some other organ by transplantation of the ureters. Plastic operations on the bladder are notoriously inefficient in relieving the condition. Flaps artfully obtained from adjacent structures may replace the missing anterior wall, but there is yet

no possibility of forming a competent sphincter muscle, which is so absolutely necessary to restoration of function. As a rule, the more successful the plastic operation, the more distressing the condition of the patient, for the leakage of urine continues unabated, and there are added symptoms due to phosphatic deposits and putrefactive changes in the newly formed closed cavity. Usually the space has subsequently to be opened in order to give drainage and expose its interior to disinfection.

Transplantation of the ureters, so that the urine will be diverted into the sigmoid or rectum was done many years ago, but for a time was practically abandoned, because in both clinical and experimental work, the patient or animal invariably died from ascending infection and resulting pyelitis and pyelonephritis.

Tuffier, in 1890, concluded from a careful study of the subject that the secondary involvement of the kidneys was not essentially the result of the implantation of the ureters into the bowel, but was due to the division of the ureter (which up to that time had been practiced), and the loss of the normal mechanism of the ureteral valves. The open end of the cut ureter predisposed to the entrance of septic material, and the inevitable cicatricial contraction of the new orifices produced obstruction to the escape of urine and consequent congestion of the kidneys.

Maydl, in 1892, made practical application of this theory and introduced his operation, which consisted in dissecting out the ureters, leaving a goodly portion of bladder mucous membrane around their terminations; then opening the abdomen and implanting the ureteral valves into the sigmoid flexure of the colon.
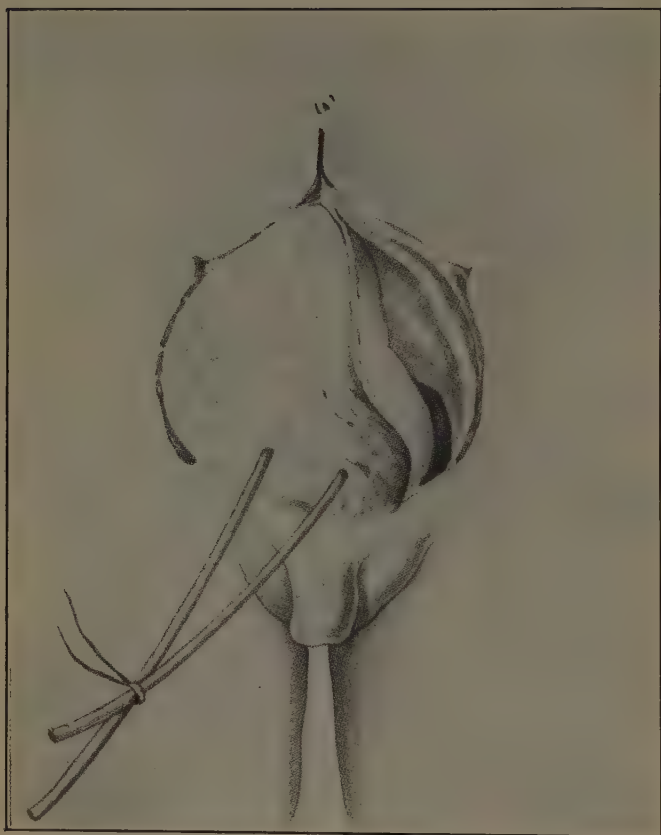
Fig. 8 —Catheterization of the Ureters and Beginning
Separation of the Bladder. (Annals of Surgery.)

Bergerhem later modified the operation so that it accomplished the same object without opening the peritoneal cavity. He makes an incision around each ureteral opening and pushes aside the adjacent tissue until an inch or more of the ureter hangs free with a rosette of mucous membrane at its tip. He next introduces a finger into the rectum and presses it upward and forward. He then dissects through the openings made in the bladder by the excision of the ureteral orifices until he reaches the anterior wall of the rectum and this is now opened. A forceps is carried through the anus and its point pushed through the incision in the bladder. The ends of the ureters are caught, drawn gently downward into the rectum and fastened with one or two stitches.

Buchanan publishes a valuable paper on the "Remote Results of Implantation of the Ureters into the Bowel for Exstrophy," in which he tabulates all recorded operations. Maydl's operations has been done 80 times with 23 deaths, a mortality of 28.7 per cent.; and Bergenhem's operation has been done 26 times with 3 deaths, a mortality of 11.5 per cent., the striking difference being largely due to the extra-peritoneal nature of the latter method.

Buchanan's investigation with reference to the remote mortality from ascending urinary infection in cases surviving intestinal implantation of intact ureters with part of the bladder wall attached, shows that in 98 instances there have been only 11 deaths.

Berger has traced the histories of 74 cases of exstrophy of the bladder not operated on and of these, 49 died before the twentieth year from renal infection. In comparing the remote death rate from pyelo-nephritis after oper-

ation, (11.2%) with deaths from the same cause in cases not operated on (66.2%), it must be remembered that many of the operative cases suffered with infection before operation, and hence surgery should not always be charged with the development of fatal complications.

Moynihan reports an operation for exstrophy done on a youth 19 years of age, in which he transplanted practically the entire bladder into the rectum without opening the peritoneum. The object of grafting such a large area of bladder was to increase the capacity of the rectum, and to form a cloaca or pouch in its anterior wall to act as a reservoir for urine. The operation appears so logical and the results reported were so satisfactory that I determined to try the method at the first opportunity. I herewith report a recent case, illustrating the steps of operation with the cuts from Mr. Moynihan's original article made available by the courtesy of the publisher of *The Annals of Surgery*.

F. H., male, 4½ years, from Winston-Salem, N. C., was admitted to the Virginia Hospital, January 5, 1909. The boy was bright and intelligent, but poorly developed physically. He had a typical case of exstrophy, the trigone and posterior walls of the bladder protruding as a red area of mucous membrane through a deficiency in the hypogastric region about twice the size of a silver dollar. The ureteral orifices showed on well marked papillae. They contracted rhythmically and ejected characteristic spurts of urine. The lining of the bladder was red and engorged, and the surrounding skin irritated and inflamed from the leakage of urine. The penis was dwarfed and grooved on its upper surface, and the symphysis pubis and umbilicus were absent. The testicles were both present in the scrotum. After a week's preparation the operation to be described was performed in a clinic before the students of the University College of Medicine.
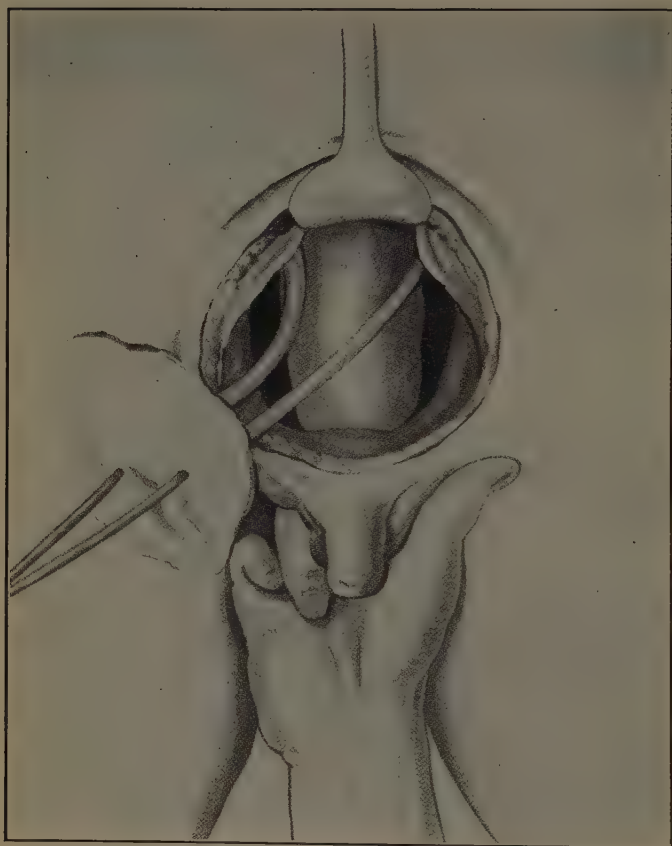
FIG. 8—The Bladder Separated and Rectum Exposed.
(Annals of Surgery.)

The boy was anesthetized with chloroform and placed in the Trendelenburg position. Ureteral catheters were inserted into each ureter for a distance of four inches. A circular incision was made around the bladder at its junction with the skin, and it was dissected from the underlying tissue until it hung free except for the two ureters. The peritoneum was not opened. The bladder was wrapped in moist gauze, placed to one side, and all bleeding carefully arrested in the cavity from which it had been removed. The sphincter ani was stretched, an assistant's finger introduced into the rectum, and the anterior wall made to bulge into the wound. A longitudinal incision was then made into the rectum and the edges of the incision caught with Volsella forceps and separated. The bladder was then rotated so that its upper margin became its lower, and its mucus surface faced the cavity of the rectum. The ends of the ureteral catheters were drawn into the rectum and out of the anus. The margin of the bladder was then carefully sutured with catgut to the edges of the incision in the rectum. The abdominal wound was lightly packed with gauze, and the patient returned to bed in good condition. Within two hours after the operation, urine was draining from both ureteral catheters. The next day the patient pulled one of the catheters out, and after this urine was passed both from the rectum and from the remaining catheter until the latter was removed. The boy did well until the fifth day, when he developed broncho-pneumonia and was seriously ill. His recovery from this complication was due to the skillful and untiring care of my colleague, Dr. McGuire Newton.

At no time was there any perceptible leakage of urine or feces into the abdominal wound. It rapidly filled with granulation tissue and in three weeks was completely healed and the patient well.

Owing to the dilation of the sphincter ani, there was incontinence of faeces for some days; soon, however, the muscle regained its tonicity. Six weeks after the operation, the patient's mother wrote me that he was able to retain his urine for a period of three hours during the day and five hours during the night. Six months after the operation she reports that there

was continued improvement in urinary control, together with a most decided change for the better in his general health.

NOTE.—Five years after operation father reports that the patient is strong and well. He goes to school regularly, and is able to retain urine without leakage as long in his rectum as other children do in their bladders.

Intestinal Obstruction from Meckel's Diverticulum *

Whether admitted or not, there is undoubtedly a general belief among surgeons that cases occur in groups; and I confess the superstition has been brought home to me by three cases of intestinal obstruction, due to Meckel's diverticulum, that have recently occurred in my practice. The symptoms, pathologic conditions and final results were so similar in all that it is unnecessary to give a separate history of each. All were men between twenty and thirty years of age; all were taken with sudden abdominal pain, followed by obstruction, distention and peritonitis; all were brought to the hospital practically moribund from sepsis; all were diagnosticated as fulminating appendicitis; all were operated upon, and all died.

In each case, when the abdomen was opened, there was the escape of a quart or more of bloody serum; in each the bowels were inflamed and distended with gas, and in each a gangrenous diverticulum was found, originating from the ileum, extending upward and inward to be attached by its tip to the mesentery, and having beneath it an incarcerated coil of small intestine. The specimen I exhibit was removed from the last case. It is 7 inches in length, one inch in its smallest diameter and is expanded at its tip into a sacculated cavity.

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* Read at meeting of the Richmond Academy of Medicine and Surgery, January 12, 1904.

The rapidity with which a strangulated diverticulum kills, and the necessity of surgical intervention even more prompt than in appendicitis, has led me to study the available literature on the subject and to report the rather unsatisfactory result.

In early fetal development the intestinal canal communicates with the vitelline sac by means of the vitelline or omphalo-mesenteric duct. This duct begins at the lower part of the ileum and passes through the abdominal wall at the site of the future umbilicus. It usually becomes obliterated at the end of the sixth week. If it does not undergo atrophy a diverticulum results shaped like a glove finger, with its base opening into the bowel and its tip either floating free in the abdominal cavity or attached by a fibrous cord to the umbilicus. Meckel's diverticulum varies in length from one to ten inches, and in diameter from a scarcely permeable tube to a protrusion the caliber of the small intestine. It is usually cylindrical in shape, but may be sacculated or expanded into cavities. The distal extremity may be smooth and tapering or it may be rough and bulbous. It is usually located about three feet above the ileo-cecal valve on the convex side of the intestine opposite the insertion of its mesentery.

If free, the distal end may become adherent to any place within the abdominal cavity which its length permits it to reach. Its most frequent point of attachment is the mesentery, although a case is reported where it was fastened to the bladder.

When Meckel's diverticulum is connected with the umbilicus by a fibrous cord it may cause intestinal obstruction by a loop of bowel becoming twisted around it. When
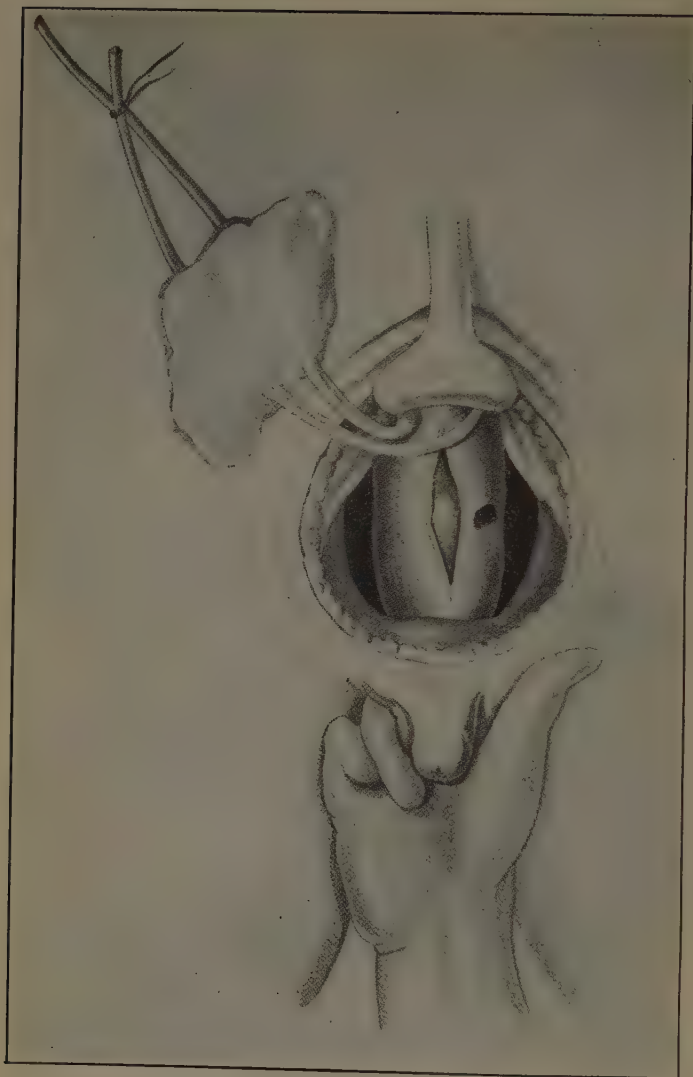
Fig. 10—Rectum Opened Ready for the Transplantation of the Bladder. (Annals of Surgery.)

it floats free in the abdominal cavity it may cause obstruction either by encircling a bowel and becoming mechanically locked by its club shaped extremity, or by the free end becoming attached to a fixed point by inflammatory adhesions and a loop of intestines being caught beneath it.

Meckel's diverticulum is said to exist in about 2 per cent. of all bodies examined. I have accidentally observed its presence several times while operating for other abdominal troubles. As the victim of the abnormality usually goes through life unconscious of its existence, and as only a small per cent. have intestinal obstruction, the number of cases reported is not large.

The symptoms due to strangulation by the diverticulum are sudden in onset. Pain is severe and persistent and referred chiefly to the region of the umbilicus. Vomiting appears early and may become stercoraceous; tenesmus and discharge of blood from the rectum are absent; constipation is as a rule absolute; the abdominal wall is not rigid but later becomes tense from distension; fever and the attending symptoms of sepsis begin with the development of peritonitis, and sometimes there is tenderness or a perceptible swelling near the umbilicus.

All writers admit that it is impossible to make a positive diagnosis in a case of intestinal obstruction due to the diverticulum, or to differentiate it from intestinal paresis due to peritonitis of appendicular origin; hence the importance of early operative intervention in doubtful cases.

Ochsner's method of treatment of peritonitis would prove uniformly fatal in mechanical obstruction. The abdomen should be opened in the middle line

and the lower right quadrant first examined. If there is a large quantity of bloody serum free from the admixture of pus a strangulated diverticulum will most likely be found. As soon as it is located the tip should be separated from the tissue to which it has become adherent and the obstruction relieved. The patency of the bowel should then be demonstrated and its walls carefully examined to see if they are damaged sufficiently to necessitate resection. Finally the diverticulum should be removed. If it is small, it may be tied and amputated like an appendix, the stump being buried or covered with peritoneum. If it is large it would be unsafe to trust to a ligature, as it might cut through and cause death from peritonitis at a time when the patient was regarded as out of danger. If the size of the diverticulum approaches that of the ileum, from which it originates, it should be amputated and the opening closed with the same care and by the same methods as an intestinal wound of the same size from other causes.
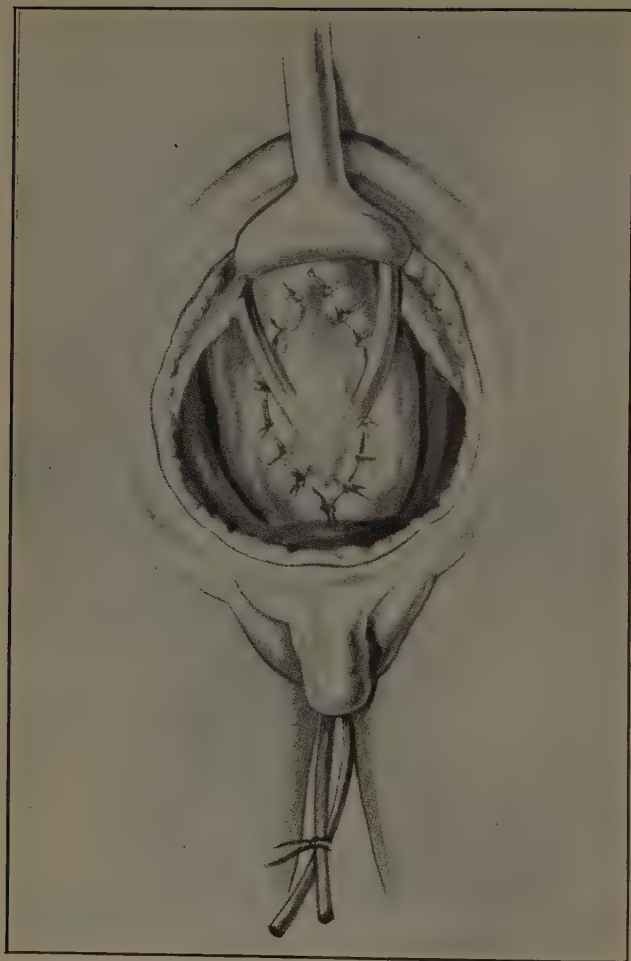
FIG. 11—The Transplantation Completed.
(Annals of Surgery.)

Obstruction of the Esophagus, With Report of Illustrative Cases *

Obstruction of the esophagus from accident or disease is sufficiently common to make the subject one of interest to every physician and surgeon. The cause of obstruction may usually be classified under one of the following headings: 1, Foreign bodies, 2, Spasm, 3, Stricture, 4, Angulation, 5, Carcinoma. The diagnosis in an individual case is based on the history and symptoms of the patient; the use of sounds, bougies and the esophagoscope; and last but not least on the result of an X-ray examination. I desire briefly to report eight cases of esophageal obstruction that have occurred in my practice. They have been selected from a fairly large series because they illustrate various types of the condition and different methods of treatment.

I. *Obstruction from Foreign Bodies.*—The first three cases represent obstruction due to the impaction of a foreign body. This accident is most frequently met with in the very young and in the insane. The foreign bodies are usually pins, coins, buttons, pieces of bone or artificial teeth. The points of impaction correspond to the level of the upper border of the cricoid cartilage, or where the esophagus is crossed by the left bronchus, or where it passes through the diaphragm.

The symptoms are nausea, sensation of obstruction,

pain and difficulty on swallowing, eructation of food and mucous, sometimes hemorrhage, and occasionally a reflex cough. In regard to prognosis the size of the foreign body is not as important as the shape. If large it may produce complete obstruction, but this condition forces the patient to seek prompt relief. If irregular or sharp pointed the patient may be able to swallow soft food and hence not recognize the urgency of the condition until ulceration of the esophageal wall leads to perforation and the involment of the pleura or mediastinum.

The character and location of the foreign body being determined, the practical question is how best to remove it. The hypodermic injection of apomorphia has been successful in some cases, but vomiting usually wedges the foreign body in more tightly and the use of emetics in this class of cases is as dangerous and unsurgical as the use of purgatives in intestinal obstruction.

If the foreign body is round or smooth, efforts should be made to extract it through the esophagoscope by means of forceps or probangs. If the body is soft, and there is no stricture in the esophagus, it may be practicable to push it into the stomach. Neither of these expedients should be tried, however, if the foreign body is pointed, sharp or angular. Here under modern surgical technique an open operation is the safest procedure.

There are two methods of approach: by an external esophagotomy or by a gastrotomy, and the selection of the route will depend on the location of the impaction. If it is opposite the cricoid cartilage an esophagotomy should be done. If it is below the level of the supraclavicular notch a gastrotomy should be performed.

Case 1, D. C., male, aged sixteen years, was a patient at the Virginia Hospital. Five days before admission, the boy sneaked into a kitchen and grabbed a hunk of meat. He was pursued by the cook, crammed the meat into his mouth and attempted to swallow it. The bolus lodged in his esophagus and the obstruction could be located with a bougie just above the cardiac opening of the stomach. The patient had been unable to take either liquids or solids and was suffering horribly from thirst. As there was no stricture of the esophagus, and as the impacted body was soft, a stiff bougie was inserted and steady pressure made, when the bolus was felt to pass into the stomach. The patient was given a glass of water, but was at first incredulous as to his ability to swallow. When the first gulp went down his expression of pleasure was ludicrous, and he drank glass after glass until he had swallowed a quart or more.

Case 2, M. S., female, aged ten years, patient at St. Luke's Hospital, gave history of putting the glass stopper of a cologne bottle in her mouth and swallowing it. The stopper lodged in the esophagus opposite the cricoid cartilage and produced complete obstruction. Eight days later she was brought to the hospital in a pitiable condition from thirst and starvation. A throat specialist was called in consultation, but despite patient and skillful efforts he failed to remove it. It was then decided to do an external esophagotomy. The patient was anesthetized and a three inch incision was made on the left side of the neck parallel with the anterior border of the sterno-mastoid muscle. The deep cervical fascia was exposed and divided. The thyroid, larynx and trachea were pulled forward and the large vessels and the nerves backward, thus exposing the esophagus. A large bougie was then passed to the point of obstruction and the esophagus incised on its tip. The glass stopper at once came into view and was easily removed.

Case 3, L. K., baby, aged seven months, was a patient at the Virginia Hospital. The baby while being dressed had seized an open safety pin and put it in his mouth. The mother in her endeavor to remove it, pushed it first into the fauces and then into the esophagus. The family physician and later a throat specialist made unsuccessful efforts to remove it with probangs.

Five weeks after the accident the child was brought to the Virginia Hospital. He was feverish, emaciated and evidently in constant pain. A skiagram located the pin in the esophagus immediately behind the heart. The safety pin was open with the point up and it was evidently impossible to remove it from above. It was therefore determined to do a gastrotomy and extract it from below. The patient was anesthetized and the abdomen opened. The stomach was incised and a finger inserted and carried through the cardiac opening. At first the pin could not be reached, but by the use of an esophageal bougie passed from above it was pushed into a position to be easily removed.

II. *Obstruction from Spasm.*—The next case illustrates obstruction of the esophagus from spasm. By this is not meant esophagismus but cardiospasm. Esophagismus is a paroxysmal contraction of the upper part of the esophagus, seen in smokers, drinkers and hysterical individuals, which is a functional disease and unattended by organic changes. Cardiospasm is a more or less constant contraction of the cardiac opening of the stomach producing an obstruction which results in organic changes such as hypertrophy of muscles, dilatation and sacculation of the esophagus and inflammation and ulceration of the mucous membrane. The term cardiospasm is an unfortunate one, for when seen or heard for the first time it is often thought to refer to some disease of the heart. The true significance of the term will be impressed if it is remembered that the stomach has two openings, the pyloric and the cardiac, and that pylorospasm is spasm of the one and cardiospasm is spasm of the other.

The etiology of pylorospasm has been settled and it is known that it is a protective effort on the part of nature to prevent the passage of irritating gastric contents into

the intestinal canal. It is a symptom and not a disease and is commonly seen in cases of chronic appendicitis, cholecystitis and ulcer of the duodenum.

The etiology of cardiospasm is undetermined. There are many theories but it would not be profitable to discuss them here, as they are unsubstantiated and contradictory. The condition was formerly thought to be rare, but it is now being recognized with increasing frequency, the accuracy of the diagnosis being demonstrated by the result of treatment.

Patients with cardiospasm are usually thought to suffer from some disease of the stomach. The symptoms often cover a period of many years but vary in intensity at different times. They consist of a sensation of pressure and fullness after eating relieved by vomiting. The regurgitation of food is accomplished with little effort and without nausea. The material spit up may be one or two pints in quantity, and consists of mucous and undigested food without trace of hydrochloric acid or pepsin. If a stomach tube is introduced a short way into the esophagus there is the escape of fluid through its lumen and along its sides. When the tube reaches the cardiac opening of the stomach an obstruction is met which is overcome by moderate pressure continued for a short time. If after emptying the esophagus the patient will drink a mixture of bismuth and buttermilk a skiagram of the chest will show the shadow of the dilated esophagus with perhaps a small stream of bismuth mixture trickling into the stomach through the spasmodic stricture at the cardia.

The treatment of this condition was formerly very unsatisfactory. Its cure is now simple, safe, prompt and

permanent. At first antispasmodics and other drugs were tried without success. Then resort was had to surgery. Mikulicz operated on and cured six patients by opening the abdomen, incising the stomach and forcibly dilating the cardiac opening. The result in this series established the principle for successful treatment and future effort was made to devise a means by which the spasmodic stricture could be efficiently stretched without opening the abdomen.

This problem has been satisfactorily met by Plummer's Hydrostatic Dilator which consists essentially of an esophageal bougie with a collapsible rubber bag at its tip. After the bougie has been passed through the stricture the bag is distended with water and the desired degree of dilatation exerted by slowly increasing the amount of fluid until the attached metre shows the requisite number of pounds pressure. After one or two treatments the spasm disappears, the symptoms are relieved and the patient gains weight and strength in a marvelous way.

Case 4, S. H., male, aged sixty-one, was a patient at St. Luke's Hospital. He stated that for the last ten or twelve years he had had trouble in swallowing. His appetite was normal but food would not go into the stomach. After eating he suffered pain and oppression and then the food either slowly entered the stomach or was vomited. His trouble had recently grown much worse and he now spit up practically all the food he took. He had lost twenty-five pounds in weight and had become more or less nervous and despondent. A stomach tube was inserted and readily pased down the esophagus until it reached the cardiac end where it met an obstruction. Gentle pressure was made and in a few moments the obstruction yielded and the tube entered the stomach. An X-ray examination after a bismuth meal showed the esophagus full of fluid which was trickling drop by drop through the cardiac opening into the stomach. A diagnosis of cardiospasm was made, and the patient was treated with Plummer's hydrostatic dilators. After being dilated three or four
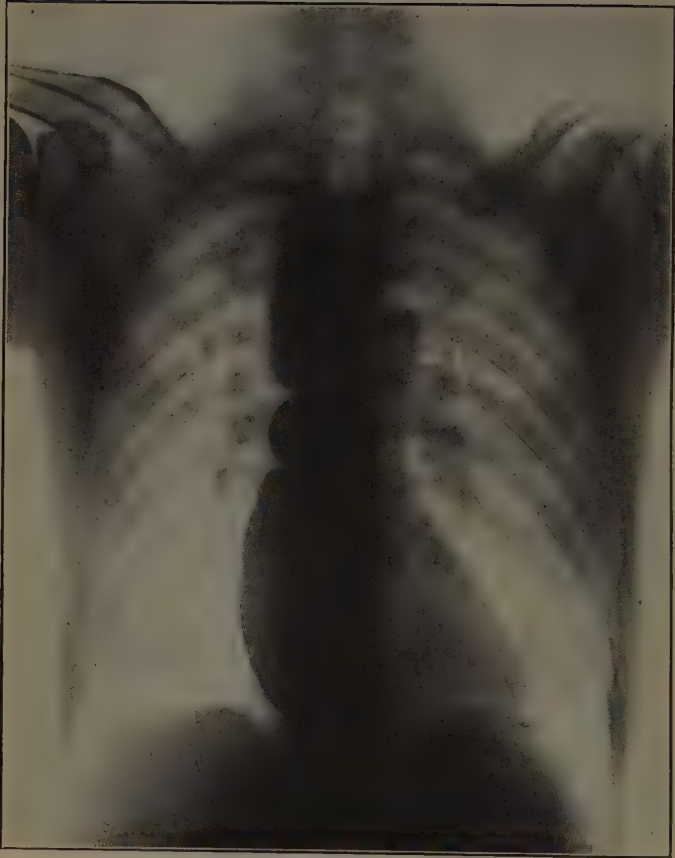
Fig. 12—Obstruction of Esophagus Caused by Cardiospasm.

times he was able to swallow without diffifficulty, and one year later reported that he had gained thirty pounds in weight and was perfectly well.

III. *Obstruction from Stricture.*—The next two cases illustrate obstruction of the esophagus from organic stricture, one the result of swallowing concentrated lye, the other the result of a severe attack of typhoid fever. The most common causes of stricture of the esophagus are syphilis, the local action of mechanical, chemical or thermal irritants and the remote results of certain acute infectious diseases such as typhoid fever, scarlet fever, diphtheria and smallpox.

When due to syphilis, the stricture is usually in the upper part of the esophagus and is of large calibre. The diagnosis is based on the history, presence of other lesions and on the Wasserman test. Stricture due to local irritants or toxic diseases are usually located near the cardia, and are diagnosed by the history and symptoms of the patient, and the use of the bougie, esophagoscope and X-ray. The treatment of esophageal stricture consists in either bloodless or operative dilatation. The expedients which have been employed to correct the condition are ingenious and interesting, but too varied and numerous to be described. If the case is seen sufficiently early it is usually possible to effect a cure by gradual dilatation with bougies or sounds. The treatment requires skill and patience and has to be kept up for months or years. In some cases where the stricture is found impermeable, or where the patient's condition requires prompt relief, the abdomen has to be opened, a gastrotomy performed and the stricture divided by Abbe's or some other method.

Case 5, A. B., male, aged two years, was a patient at St. Luke's Hospital. Some months before, the child in crawling about the floor found a saucer containing concentrated lye that had been used to remove grease spots, and as babies usually do when investigating new objects, he put some of the lye in his mouth and swallowed it. The symptoms of stricture soon followed. On admission the patient could only take a few drops of milk at a time and was nearly dead from starvation. After long effort under chloroform anesthesia a very small bougie was finally passed through the stricture. A progressively larger sized bougie was introduced at intervals of several days and this treatment continued for some weeks. The child was then sent home with instruction to bring him back at stated intervals for observation and treatment. This was faithfully done by the parents who fortunately did not live at a great distance. When the patient was about six years old the father was told that it was unnecessary to continue the administration of choloform in order to pass the bougie. He hesitated a moment and then said "Please give it to him twice more as that will be one hundred times he will have taken it and some day he will be proud to tell about it." The boy is now ten years old and is apparently completely well.

Case 6, H. B. R., male, aged 22, was a patient at St Luke's Hospital. Four months before admission he was taken with typhoid fever and confined to bed for seven weeks. During the last ten days he was in bed he noticed a progressively increasing difficulty in swallowing liquids, and when he was finally given permission to eat solid food he found that the food would not pass into the stomach, but lodged in the esophagus, where it remained until he either vomited or gulped it up. An esophageal bougie showed an obstruction three or four inches above the stomach. An X-ray plate made after drinking a mixture of bismuth and buttermilk showed a stricture of small calibre and about three inches in length at the lower end of the esophagus. Efforts at dilatation on three successive days failed, but finally a small bougie was passed. The stricture was slowly but steadily dilated. The patient remained in the Hospital eighteen days and

Fig. 13—Obstruction of the Esophagus Due to Stricture the Result of Typhoid Fever.

gained eighteen pounds in weight. He was then sent home to his family physician to have the treatment continued.

IV. *Obstruction from Angulation.*—The next case illustrates obstruction of the esophagus from angulation due to diaphragmatic hernia.

Case 7, B. D., male, aged nineteen, was a patient at St. Luke's Hospital. He stated that four months before his admission he had been struck in the abdomen and knocked down. His antagonist then jumped on him and cut him with a pocket knife on the neck and outer side of the arm, and finally stabbed him in the left side of the chest. For three days he was unconscious and for three weeks he could take no food by mouth and had to be sustained by nutritive anemas. He then began to swallow liquids, but if he attempted to eat solids he experienced the sensation as though the food stopped before it reached the stomach, and he would spit or vomit it up shortly afterwards. An attempt was made to pass a stomach tube, but it met with complete block 17½ inches from the incisor teeth. A mixture of bismuth and buttermilk was given slowly by mouth and after eight ounces had passed into the stomach a skiagram was made, when it was found that the man had diaphragmatic hernia, and that the stomach was in the left thoracic cavity. The obstruction in the esophagus was obviously due to angulation. The patient's thorax was opened by raising a rectangular flap consisting of the entire thickness of the chest wall and containing sections of the eighth and ninth ribs. Adhesions between the herniated stomach and the heart, lung and pleura were separated, the stomach was returned to the abdominal cavity and the rupture of the diaphragm sutured. The patient made a rapid recovery and was completely relieved of his previous difficulty in swallowing.

V. *Obstruction from Carcinoma.*—The last case illustrates obstruction of the esophagus from carcinoma.

Case 8, J. A., male, aged fifty-nine, was a patient at St. Luke's Hospital. The man's previous history was negative. The present

symptoms had begun two months before his admission and consisted of difficulty in taking food. If he swallowed any solid material it caused pain in his chest and then in a few minutes he could feel it enter the stomach and the pain was relieved. During the last few weeks he had been unable to swallow any solid foods and even liquids remained in the esophagus and were regurgitated several hours after being swallowed. For the past week he had been sustained by nutritive enemata. There was no history of syphilis, of acute infectious disease or of swallowing a caustic. X-ray showed a stricture at the cardiac end of the stomach. An esophageal bougie could not be passed and hence an abdominal section was decided on in order to demonstrate the nature of the lesion. The abdomen was opened, and after delivering and palpating the stomach, a hard, annular growth was found completely obstructing the cardiac orifice. As the disease was unquestionably malignant, a gastrostomy was done by Senn's method, and the patient was afterwards fed through the tube by means of a funnel. He gained weight and strength in a most satisfactory way, and was sent home in good shape. Three months later he was found dead in bed and it was thought it was probable he had committed suicide.

FIG. 14—Obstruction of Esophagus Caused by Cancer of the Cardia.

Diaphragmatic Hernia, With Report of a Case*

Diaphragmatic hernia is the protrusion of one or more of the abdominal viscera into the pleural cavity through an opening in the diaphragm.

The opening may be a defect in development, a dilatation of a normal aperture, or a rupture due to traumatism. Therefore diaphragmatic hernias may be either congenital or acquired.

In ten per cent. of cases the herniated mass is enclosed in a peritoneal sac, but in ninety per cent. of cases the viscera lie bare in the pleural cavity, hence in a strict sense these hernias may be divided into true and false.

According to statistics diaphragmatic hernia occurs on the right side in eight per cent. of cases, and on the left in ninety-two per cent. of cases. The relative immunity of the right side is largely due to the presence of the liver which acts as a buffer and protects the diaphragm on that side from the effects of increased abdominal pressure and closses effectively any rupture that may occur

The abdominal organs most frequently found in a diaphragmatic hernia are the stomach, colon, small intestines and omentum in the order named. Almost every abdominal organ, however, except the rectum and pelvic viscera has been found in one or more of the cases that have been recorded.

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*Read at a meeting of the North Carolina State Medical Association, Raleigh, N. C., June, 1914.

Diaphragmatic hernias are not common, but they occur with sufficient frequency to make it necessary to bear the condition in mind when making a diagnosis in an obscure case. At the time of the publication of Giffin's paper in the Annals of Surgery for March, 1912, six hundred and fifty cases had been reported, but most of these were either congenital hernias occurring in babies or symptomless hernias discovered at autopsy. According to Giffin, only fifteen cases of diaphragmatic hernia had been correctly diagnosed during life.

The recognition of the condition is based on a careful inquiry into the patient's previous history, especially with reference to injuries, on a thorough physical examination of the chest, and on radiographic and fluoroscopic examinations after the ingestion of a bismuth meal. The conditions most difficult to exclude in making a differential diagnosis are pneumothorax and eventration of the diaphragm.

The treatment of diaphragmatic hernia is essentially surgical. While patients with the trouble have been known to live for years, sooner or later they all develop obstructive symptoms, inflammatory complications or strangulation with gangrene.

Two exploratory routes have been recommended to reduce the hernia and repair the tear in the diaphragm—the thoracic and the abdominal. Those who favor the thoracic route claim that the adhesions can be more safely separated, that the diaphragmatic opening can be more easily sutured and that by the entrance of air into the pleural cavity the negative pressure or suction power of the thorax is abolished so that replacement of the viscera is less difficult.

FIG. 15—X-Ray of First Case, Before Operation, Showing Stomach in Left Thoracic Cavity.

Those who favor the abdominal route claim that a considerable number of hernias can be reduced without opening the thorax, and that it is not wise to collapse the lung if it can be avoided; also that the viscera injured from strangulation are the abdominal organs and that they can be better repaired through an abdominal incision.

The following brief quotations from various authors will show the evolution of surgical opinion on the subject of diaphragmatic hernia during the last twenty-five years.

Holmes' System of Surgery, published in 1881, contains the following: "We are silent on the subject of treatment. We can not hope to close the aperture in the diaphragm by any measures which science or mechanical surgery would justify; could we accurately detect the existence of a protrusion it were in vain to attempt its reduction with any benefit to the patient or credit to ourselves."

Von Bergmann's Surgery, published in 1904, states: "Up to this time no radical operation has ever been performed for non-strangulated hernia in this region, although an operation is indicated provided the diagnosis is certain."

Fergusson in his book, Modern Operations for Hernia-published in 1907, says: "The presence of diaphragmatic hernia is seldom discovered during life. In but seven of the two hundred and sixty-six cases reviewed by Lachner was the diagnosis made ante-mortem. If the hernia is incarcerated I believe the thoracic route the preferable one, but in a case where the hernia is inflamed, ulcerated, strangulated or gangrenous when a resection of the bowel

must be done the thoracic insures less tendency to infect the peritoneal cavity."

Ochsner in his Clinical Surgery, published in 1911, says: "Diaphragmatic hernias are very rare, and when they do exist are seldom discovered before the abdomen is opened. The majority of cases that have been reported have been found at post-mortem. Diaphragmatic hernia may be congenital or acquired. The congenital variety is rarely amenable to surgical treatment because so great a portion of the diaphragm is absent that it is impossible to close the large opening. The acquired variety may frequently be benefited by operation."

Mumford in his book on Practice of Surgery, published in 1911, says: "The treatment of strangulated diaphragmatic hernia is obviously to open the abdomen and treat the viscera as the conditions indicate. Hitherto no operation is reported as performed upon a non-strangulated diaphragmatic hernia."

Binnie in his Operative Surgery, published in 1914, says: "Of the cases of strangulated diaphragmatic hernia collected by Neugebauer all those operated on through the abdominal route died; one out of the two operated on the thorax lived. The only two cases of non-strangulated diaphragmatic hernia submitted to radical cure (Llobet's and Cranwell's) lived after a trans-thoracic operation."

Doubtless some cases of diaphragmatic hernia have been operated on and not reported, and other cases have been operated on and recorded since the statistics quoted were compiled, still the total number of operations is so small that I feel justified in reporting the following case:
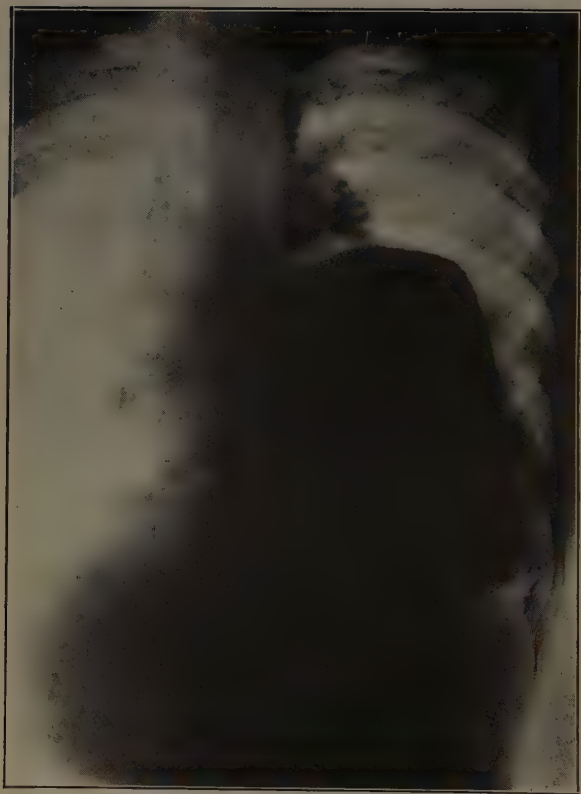
FIG. 16—X-Ray of Second Case, Before Operation,
Showing Stomach in Left Thoracic Cavity

B. D., male, aged 19; entered St. Luke's Hospital April 10, 1914, referred by Dr. J. B. Catlett, of Staunton, Va. Patient stated that four months ago as he came out of a pool room he met a man with whom he had quarreled earlier in the day, who struck him with great force in the epigastrium with a bottle. The blow knocked him down and his antagonist jumped on him and cut him on the left side of the neck, on the outer side of the left arm, and finally stabbed him in the posterior axillary line about the third intercosal space on the left side of the chest. The patient bled profusely from the wounds, vomited blood and later passed much blood by bowel. The incisions were sutured without an anesthetic and the patient put to bed. For three days he was unconscious. He finally began slowly to improve, but for three weeks he could take no food by mouth and had to be sustained by nutritive enemata. He then became able to swallow and retain liquids. If he attempted to eat solids, however, he experienced a sensation as though the food stopped before it reached the stomach, and he would spit or vomit it up shortly after swallowing it.

When the patient was brought to Richmond he was very weak and anemic and had lost about fifty pounds in weight. Physical examination of the chest showed the heart markedly displaced to the right and a tympanitic percussion note with absence of breath sounds from the fifth rib down on the left side. An attempt was made to pass a stomach tube, but it met with a complete block 17½ inches from the incisor teeth.

A mixture of bismuth and buttermilk was given slowly and after about eight ounces were introduced into the stomach several radiograms of the abdomen were made by Dr. A. L. Gray. The history, symptoms, physical examination and X-ray findings all pointed to diaphragmatic hernia, with escape of practically the entire stomach into the left thoratic cavity.

An operation was advised and agreed to. It was determined to adopt the transpleural rather than the abdominal route, as the hernia had been in existence for four months, and it was believed that the adhesions between the stomach and the viscera of the chest were so strong and numerous that they could not be safely separated except under direct inspection.

The patient was placed on the table in the reverse Trendelenburg position in order to minimize the possible shock from the sudden admission of air into the pleural cavity.

The incision was made after the method suggested by Cranwell. The lower and lateral part of the thorax was opened by a flap having its base above, consisting of the whole thickness of the chest wall and containing about five inches of the eighth and ninth ribs. As soon as the parietal pleura was opened the stomach presented itself. There were numerous adhesions between it and the pericardium and collapsed left lung. These were carefully separated, several attachments requiring preliminary ligature.

A very dense and firm adhesion was found between the cardiac end of the stomach and the postero-lateral surface of the chest wall just opposite the stab wound. This was peeled loose after considerable effort and there was at once the escape of some stomach contents. The stomach was delivered through the opening into the thorax and an incision three inches long found on its anterior surface beginning near the esophageal opening and extending in the direction of its greater curvature. The edges of this incision did not bleed and showed evidences of cicatrization, hence it seems reasonable to believe that the rupture of the diaphragm and hernia of the stomach resulted from the blow and injury inflicted on the abdomen prior to the cutting, and that when the stab wound was made in the third intercostal space the vulnerating instrument cut the stomach which was already in the left thoracic cavity.

The opening just described in the stomach was sutured in the usual way, and then the adhesions to the stomach where it passed through the diaphragm were separated, and the stomach replaced in the abdomen.

The rupture in the diaphragm was about four inches in length, beginning near the esophageal opening and extending through the left leaf toward the sternum. The tear was repaired with two tiers of chromic catgut sutures. A rubber drain was then placed in the pleural cavity and the opening in the chest wall closed. The operation while spectacular was not difficult and was completed in fifty-five minutes. There was little bleeding

FIG. 17—Incision in Operation by Thoracic Route.
(Copied from Binnie))

and no appreciable shock. The patient did not suffer from nausea, and begged for a cigarette as soon as he became conscious. Liquid nourishment was given the following day. At the end of a week the patient was placed on general diet and from the first swallowed and retained solid food without difficulty.

He gained weight at the rate of a pound a day and left the hospital in four weeks after the operation. A radiogram taken just before the patient was dismissed showed the stomach in its normal position, the heart almost back in its proper place, but the collapsed lung not yet fully expanded.

Second Case of Diaphragmatic Hernia operated on after the above was published.

R. M., male, aged 34, entered St. Luke's Hospital November 27, 1914, referred by Dr. W. N. Thomas, of Oxford, N. C. Patient stated that seven months ago while working on the roof of a house a rope broke and he fell a distance of thirty-four feet. He was unconscious for two hours. On examination it was found that he had fractured both bones of his forearm, injured his left hip and received numerous cuts and bruises. He suffered with pain and soreness in the epigastrium and hiccoughed for three days. There was nausea but no vomiting. Patient was confined to bed for six weeks. He had little appetite and what he ate caused distress. When he finally got up and began to walk, he noticed a gurgling sound in his left chest similar to what he had frequently heard and felt in his abdomen before the accident.

In July he came to Richmond and entered a hospital in order to have the bones of his arm reset. The surgeon in making his general examination, recognized the presence of a diaphragmatic hernia, and confirmed his diagnosis by an X-ray plate. The patient was operated on for the vicious union of the bones of the forearm but declined to have anything done for the rupture of his diaphragm. He returned home, but suffered so much from indigestion and shortness of breath that he was finally persuaded to come to me for surgical relief.

Physical examination showed the left chest larger than the right. There was hyperresonance from the fourth rib down, and peristaltic sounds were plainly audible. An X-ray plate made after a bismuth meal showed practically the entire stomach in the left pleural cavity. The patient had lost twenty pounds in weight, but was otherwise in good general condition.

The patient was placed on the table in the reverse Trendelenburg position and the left thoracic cavity opened by Cranwell's incision. As soon as the pleura was opened and the negative pressure relieved, the stomach and other herniated viscera returned to the abdomen. The left lung was completely collapsed. There was a tear in the diaphragm about five inches long, extending from the left margin to the esophageal opening. The liver, spleen and other abdominal organs could plainly be seen. There were no adhesions except between the margins of the hernial opening and the great omentum, and these were easily separated.

The tear in the diaphragm was repaired with chromicized catgut sutures, and the incision in the chest wall closed without drainage.

The patient lost little blood, showed no appreciable shock, and at this writing, one week after the operation, has had no symptoms to cause discomfort or give anxiety. The patient is now on general diet and states that he is completely relieved of his former digestive disturbance, and also that "it is a great satisfaction to feel the food go to the proper place."